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THE AMERICAN GAS LIGHT JOURNAL

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

[OFFICIAL NOTICE.]

Cost of Proceedings, Western Gas Association, to Non-Members.

WESTERN GAS ASSOCIATION, OFFICE OF THE SECRETARY,
NEW ALBANY, IND., Sept. 29, 1899.

Bound copies containing the Proceedings of the Western Gas Association for the years 1896-97-98 can be obtained for the sum of $2 each. Make your remittances payable to the Secretary.

JAMES W. DUNBAR, Secy.

[OFFICIAL NOTICE.]

Twenty-seventh Annual Meeting, American Gas Light Association.

GENERAL ANNOUNCEMENT.

OFFICE OF THE SECRETARY,
NEW YORK, Sept. 28, 1899.

There will be an annual meeting of the American Gas Light Association held at New York city, October 18th, 19th and 20th, 1899. The meeting will be called to order by the President, Mr. Alex. C. Humphreys, of New York city, at 10 A.M., Wednesday, October 18th, in the meeting hall, which will be in Sherry's new building, corner of Fifth avenue and Forty-fourth street.

The headquarters will be at the Herald Square Hotel, Thirty fourth street, between Broadway and Seventh avenue. This is a new hotel, to be opened October 1st. All members should get rooms at headquarters.

The most satisfactory quarters are always obtained by writing in advance to the hotel people, and in doing so a reply should be requested, for which a self addressed stamped envelope should be enclosed, as misunderstandings may thereby be averted. If you write before October 5th, address Mr. C. F. Wildey, Cosmopolitan Hotel, New York city.

The Herald Square Hotel will be conducted on the European plan, and rates for rooms will be as follows:

Rooms without bath occupied by one person, from $1.50 to $2.50 per day; rooms with bath, occupied by one person, from $2.50 to $4 per day. When room is occupied by two persons the total charge in every case will be $1 more per day than when the same room is occupied by one person; that is, $2.50 for $1.50 rooms, and so on. Members of the Association occupying rooms without bath will have the privilege of using the general bath rooms, with which each floor is provided, free of charge.

The roll call will be made by means of the door card system. Each member upon entering the hall for the first time will at the door receive a special card upon which he will find his name and address, etc., as these appear on the Secretary's books, and such card should be corrected and given to the doorkeeper. Members in attendance should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

A blank form of application for membership accompanies this circular. More can be obtained of the Secretary. Remember, all applications must be in the Secretary's hands by October 8th at the very latest, otherwise they will not be acted upon at this meeting.

The list of papers to be read at the meeting is as follows:

"Another View of Interior Illumination," by Mr. F. N. Morton, Hoboken, N. J.

"The Steam Consumption in a Water Gas Plant," by Mr. Alten S. Miller, New York city.

"The Pumping of Gas," by Mr. George J. Roberts, Phila., Pa.

"Carbureted Water Gas as a Coal Gas Auxiliary," by Mr. A. G. Glasgow, London, England.

"Some Experiments with the Edgerton Standard," by Mr. Rollin Norris, Philadelphia, Pa.

"Notes on Prepayment Meters," by Mr. Alexander H. Strecker, Newark, N. J.

A lecture will be delivered to the Association by Dr. Henry Morton, President of the Stevens Institute of Technology, Hoboken, N. J., upon "Recent Development of Artificial Illumination."

If the papers are of a sufficiently high standard the Beal Medal will be awarded to the author of the best paper presented; the question of which is best to be decided by the constituted Committee.

All questions for the Question Box should be sent to the Secretary as soon as possible, in order that they may be printed and mailed to members before the meeting, thus insuring their discussion.

During the days of the meeting all the announcements will be posted on the bulletin boards at the hotel and in the meeting room. All members are warned to take notice thereof accordingly.

All members attending the meeting are particularly requested to wear their membership badges in plain sight, thereby greatly aiding the officers and the local committee in their work by affording a ready means of recognition.

In order that the Year Book containing the report of this meeting may be published and issued to the members immediately after the meeting, notice is hereby given that if any of the speakers at this meeting desire to correct their remarks before they are printed they will be given an opportunity before leaving New York city, but not after. The stenographer will have type written copy of the principal discussions prepared at the headquarters between the sessions of the meeting, and all those who desire to correct their remarks must notify the Secretary at the close of the session at which such remarks are made, as all the reports will be turned into the printer immediately after the adjournment of the meeting.

Special rates for transportation have been granted—viz., full fare going and one third fare returning—by the several Passenger Associations named and under the conditions noted:

The Trunk Line Passenger Committee, covering territory west of New England and East of Niagara Falls, Buffalo and Salamanca, N. Y., Pittsburg, Pa.; Bellaire, O.; Wheeling, Parkersburg, and Charleston, W. Va.

The New England Passenger Association, covering nearly all of the lines in the New England States.

The Central Passenger Association, covering the territory bounded on the east by Pittsburg, Salamanca, Buffalo and Toronto; on the north by the line of and including points on the Grand Trunk Railway, from Toronto to Port Huron, thence via Lakes Huron and Michigan to the north line of Cook county, Ills.; on the west by the west line of Cook county and the Illinois and Mississippi rivers to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis; and on the south by the Ohio river, including points on either side of that river.

The Southeastern Passenger Association, covering the territory south and west of the Virginias and south and east of the Ohio and Mississippi rivers.

The Western Passenger Association, covering the territory west of and not including Chicago, Peoria and St. Louis; in other words, the territory west of that of the Central Association.

[Here follows instruction by the Secretary as to the conditions under which the one and one-third fare for the round trip may be obtained. These conditions are practically similar to those that have heretofore obtained.]

SPECIAL.

Since many of the members will wish to see something of the city, it has been decided to hold only one business session each day, beginning at 10 A.M. sharp an continuing until 2 P.M. If the members will meet promptly and attend strictly to business it will be possible to get through with full as much of this as is usually done in the four shorter sessions, and at the same time have an opportunity for sight-seeing in the afternoon. It is hoped that the members will aid in expediting the business of the meeting by being on hand at the appointed time each morning. The President has announced his intention to call the meeting to order each day, at the time set, even though only a bare quorum is present.

If sufficient numbers of subscriptions are obtained the social programme will be as follows:

Thursday evening a banquet, to which ladies will be admitted on equal footing with the gentlemen. Friday, a steamboat ride around New York harbor. Tickets admitting members and friends to these entertainments can be had for $5 each. If you wish to join in them please sign enclosed card and return it to the Secretary at once. It will be necessary to have at least 200 subscriptions. Please send in your subscriptions at once, so that the Committee can tell whether they can go ahead and arrange for these entertainments.

Be sure to obtain a railroad certificate when buying your ticket for New York, as the greater the number of certificates handed in the easier it is to get the reduction in rates for future meetings. This is intended to apply especially to members coming from points comparatively nearby, such as Philadelphia, etc. Apply for ticket and certificate at least 30 minutes before train time.

Each person must sign his own certificate at time of purchasing tickets for New York. Be sure to hand the Secretary your certificate as soon as you reach the headquarters. Apply for return ticket at least 30 minutes before train time and have your certificate with you. All persons, ladies included, attending the meeting are entitled to the reduced rate from the territories named.

Members will please hand their certificates to the Secretary, or his clerk, upon arrival at place of meeting. If there are 100 members present holding certificates each certificate will then be properly endorsed, and handed back to owner before adjournment.

Keep this circular in your pocket and apply to it if you are in doubt.

ALFRED E. FORSTALL, Secy.

BRIEFLY TOLD.

THIS MEETING OF THE AMERICAN ASSOCIATION.—The preparations for the meeting next week in this city of the American Gas Light Association are in that satisfactory stage of completion which guarantees that those who will attend it will enjoy it. The Herald Square Hotel headquarters, even though the house is new, which really should be considered a right good point in its favor, can safely be counted upon to accommodate all who seek shelter and good cheer from the thought and hands of Mr. Wildey and his help. Just the same, it would be well to send word at once to him that quarters should be reserved. The rates are plainly shown in Secretary Forstall's announcement. Respecting the latter no change is made this week, simply for the reason that everything so far announced goes as it has been published. The plan of causing the sessions to be continuous, between hours of 10 A.M. and 2 P.M., has been received with pronounced favor. Those who have not subscribed to the proposed entertainment should do so at once, in order that the Committee of Entertainment should know at the earliest moment for how many it shall have to care.

OBITUARY NOTE—COLONEL JEROME CROUL.—Last week we briefly noted that Colonel Jerome Croul, since 1849 a respected resident of Detroit, Mich., and for many years largely interested in the gas business, died in Detroit at an early hour of the morning of September 26th. Deceased was born in Lyons, N. Y., March 19, 1829, where he acquired the elementary training that stood him so well in after years for his battles in the commercial world. His first combat with the latter was in Rochester, N. Y., where he gained some insight respecting machinery through a shop apprenticeship. His next venture was as a clerk in the employment of a Rochester wool dealer, and in 1849 he removed to Detroit where he engaged in the wool and sheepskin trade with Mr. J. E. Parsons, of Rochester, under the firm name of Parsons & Croul. In 1854 Mr. Parsons died and the subject of our memoir took his brother (the late William H. Croul) into partnership, the title of the firm being Croul Brothers. They branched out into the tanning trade and prospered wonderfully. On the death of his brother two other brothers and his son were admitted to the partnership, and the prosperity of the old concern was exceeded by the development of the new one. Some years ago its identity was merged into the live establishment now known as the Detroit Oak Belting Company. As time went on he became largely interested in other bustling business enterprises of his city, with the result that his name frequently appeared as a Director or other officer in its various banking and insurance interests. At the time of his death he was Second Vice-President of the Wayne County Savings Bank, President of the Michigan Wire and Iron Works, President of the Windsor (Ont.) Gas Company, a Director in the Port Huron (Mich.) Gas Company and a prominent shareholder in the Goshen (Ind.) Gas Light Company. He had been a large owner in the shares of the old Detroit Gas Light Company, parting therewith at the time that the present syndicate secured control of its properties. He was an active member of the Western Gas Association since 1888, and in the favor of his fellow members he always had high place. He was one of the organizers of the famous Detroit Light Guards (1855), and in 1862 Governor Blair appointed him a member of his staff, with the rank of Colonel. He was prominent in local governmental matters, too, more particularly in respect of Detroit's Fire Department, with which he was actively connected from 1872 to 1888. He is survived by his wife, a daughter and two sons. His personality was of the sort that makes friends and keeps them, and he will be honestly mourned, not only by his associates and intimates, but by many who were quietly assisted through his giving hands. The funeral services were held in his late residence the afternoon of September 27th and interment was made in Elmwood Cemetery. The pall bearers were: Mr. Chas. F. Collins, President of the Wayne County Savings Bank; Mr. I. B. Unger, Cashier of the Preston National Bank; Mr. James T. Lynn, ex-President of the Western Gas Association, and Messrs. Joseph Keen, Hugh O'Connor and Cory Andrews.

NOTES.—We regret to report the death of Mr. W. W. Prichard, formerly purchasing Agent and Superintendent of the Portsmouth (Ohio) Gas and Electric Company, whose demise occurred the morning of Friday, September 29th. He had been prominent for years at the meetings and in the councils of the Ohio Gas Light Association.—Still another death we have to report is that of Mr. William Duffield, since 1883 President of the City Gas Company, of London, Canada, who died at his home, 517 Queens street, London, the afternoon of September 25th. Deceased, who was in his 62d year, was one of the earliest and most successful exploiters of the Canadian oil fields.—The Matawan and Keyport (N. J.) Gas Light Company will be hereafter operated under the title of the Standard Gas Company of New Brunswick, N. J. It is capitalized in $50,000 and bonded in $65,000, the interest rate of the latter being 5 per cent.

[Translated for the JOURNAL, by Mr. F. Egner, from the *Journal fur Gasbeleuchtung.*—Concluded from Page 528.]

Preventing the Thickening of Tar.

[A paper read at the 39th Annual Meeting of the German Association of Gas and Water Engineers, by MR. G. LIEGEL, of Stralsund.]

To insure good liquid tar, and yet not contract the producing power of the retorts overmuch, I work at the rate of four charges in 24 hours. By so doing the labor of the stoker is made easier than it is with smaller, though more frequent, charges; but if one has the old, narrow kind of benches to contend with, the middle retorts of which despite all precautions become overheated anyhow, it is well to make an exception and charge such retorts oftener. I now come to the important question of how much gas may be withdrawn from the coal. To settle that problem I again experimented when I had but one bench under fire. I began with 29 cbm. from 100 kg. (1,024.10 cubic feet from 220 46 pounds) and gradually raised at the rate of ½ cbm. (17.65 cubic feet), and kept at that particular yield for some days in each instance so as to enable me to observe closely both gas and tar. With the yield up to 31 cbm. (1,094.73 cubic feet) no difference in the constitution of either gas or tar was noticeable.

At 32 cbm. (1,130.04 cubic feet) it could be seen that both became somewhat worse. At 33 cbm. (1,165.36 cubic feet) there was a sensible reduction in the illuminating power of the gas, and a deposit of dry powder in the ascension or standpipe. This set the limit as to how far I might go with my coal. I, therefore, hold the yield which may be safely taken from the coal at 31 cbm. per 100 kg. (1,094.73 cubic feet from 220.46 pounds) as measured by the station meter and entered up in the manufacturing book. Accordingly, the quantity written down on the order slate of gas required from the charges is, 31½ cbm. from each 100 kg. of coal (1,112.38 cubic feet from 220.46 pounds).

This, of course, occurs provided the coal in use is of fair average quality; that is to say, if it does not contain much slack, and has not been exposed to much rain. From the preceding we find that under these conditions the average maximum performance of the regular German normal oval retort (dimensions as previously given, 20.66 inches by 14.96 inches by 9 feet 6 inches inside) is 217 cbm. (7,663.13 cubic feet) and 75 cbm. per running meter, approximating 807 cubic feet. per lineal foot of retort.

[Neither in this nor the following examples are the figures of the performance per running meter correct, probably owing to a misprint; but they are near enough for a practical comparison.—F. E.]

My "D" retort to which I have referred before (24 8 inches by 13.7 inches by 9 feet 6 inches inside) gives, under the same conditions in 24 hours, 254 cbm. (8,969.75 cubic feet) and 87 cbm. per running meter; about 944.18 cubic feet per lineal foot of retort. These results may always be obtained with ease.

On a certain occasion I was able to run a bench of nine retorts for 20 consecutive days to nearly its maximum capacity, at which time I obtained the following results: The weight of each charge was 1,650 kg. (3,637.62 pounds), or 183½ kg. per retort per charge (404.18 pounds). The yield was 30.98 cbm. per 100 kg. of coal (1,094.01 cubic feet per 220.46 pounds), therefore the performance per retort and day was 227.2 kg., or nearly 8,024.06 cubic feet.

If one wishes to increase the efficiency of the bench, if only by giving it 4¼ charges in the 24 hours, besides the other difficulties named, the retorts would be more seriously affected and consequently their life shortened. Therefore, regard for saving of the bench here too fixes a limit.

Should it be desired to test the durability of retorts obtained from various places, it is not enough to merely take into consideration the amount of gas produced or number of days fired. The sectional dimensions, thickness of retort wall, order and plan of setting, degree of heat applied, weight and number of daily charges, gas produced per day, frequency of scurfing and use of scurfing bar, all act a part and must enter into the calculation. The only sure or reliable method of testing retorts obtained from differing sources is to put them into the same setting, side by side, right and left. Directly after the first filling of the hydraulic main with water the pressure in the retort equals the depth of dip, or seal, provided that the exhauster is operated at zero. In my case, this pressure is 30 mm. (nearly 12 tenth inches.) Now, if the tar made is of a good, thinly liquid consistency, the upper strata of liquor in the hydraulic main will consist of water and the pressure in the retort will remain unchanged. Upon making a measurement of same at my works showed a fluctuation of from 12 mm. to 48 mm., and an average of 12 tenth inches, which showed that the bench worked as it should.

The gas leaves the retort in a continuous stream; but passes the seal only by puffs in the form of bubbles, whenever the pressure within the retort has gathered force enough to be able to overcome the resistance of the seal, hence the clucking sound heard in front of the bench.

Before the liquid (previously forced out by the passing gas) can return into the dip-pipe there occurs an appreciable short period of lessened pressure, and because of the shove-like backing in again of the seal into the dip-pipe there is also caused a momentary heightening of the pressure. A pressure gauge plainly shows this play.

On that account too the pressure reduction (by passing the seal), which has now for a long time been kept very quiet, is of small value. To enable one to have a correct adjustment of the seal the bottom ends must be of an even length, and be in an exact horizontal line; for which reason the lower ends of the dip-pipes and the corresponding flanges, are turned off in a lathe, while the rest-plates on top of the hydraulic main, upon which the flanges of the dip-pipes lay, are planed off together in a piece. One must also take precautions to keep the seal from being changed through motion of the hydraulic main itself.

This I accomplish by placing the hydraulic main upon columns, which are supported on a small foundation which is in no way connected with the mason work of the bench. The only connection between bench and hydraulic main is the ascension and bridge pipe; and as this can slip up and down a little in the pipe collars, a slight movement in the bench can do no harm.

I have now operated in this manner for a couple of years; and, in the fiscal year ended March 31st last, have obtained an average yield of 30.90 cbm. of gas from 100 kg. of coal (1,091.20 cubic feet from 220.46 pounds).

[The reader is reminded that these figures represent the corrected quantity of gas made, after the usual deductions.—F. E.]

The make per retort, all being of the normal oval type (not his own design previously described, the dimensions of which are given on another page as 20.66 inches by 14.96 inches by 9 feet 6 inches inside) and day during the same period was 219.6 cbm. (7,754.9 cubic feet). The size of the works seldom admits working the benches at their maximum capacity. During all that time I have been spared the plagues resulting from sluggishly flowing tar and its concomitant losses; and the stokers have had comparatively easier work than formerly. Stoppages in ascension pipes occur but very seldom and the regular clearing out of the same renders this work much less difficult than it would be by waiting until the pipes are completely stopped. The tar has been good and oily all the time, even after getting cold. But this yield of 31 cbm. (1,094.73 cubic feet) is not to be taken as a general criterion for all kinds of coal. Every engineer must regulate the yield for himself, as consideration for the illuminating power of the gas, composition of the tar, and economical management of his benches may lead him to determine upon.

It will be well to repeat this testing from time to time, because coal does not always turn out alike, even though it did come from the very same mine.

To recapitulate briefly. The constructor must see to it:

1. That the retorts are protected against uneven heating.
2. That the gas may be thoroughly cooled as soon as it leaves the retort.
3. That means are provided for readily getting at the inside of the hydraulic and primary portion of the principal main.
4. To provide suitable means for the maintenance of the depth of seal on the dip pipe.

The manager of the works must see to it that—

1. The "following rake" previously described is used.
2. Observe long intervals of time between charges.
3. To avoid scurfing of retorts in close succession.
4. To avoid needlessly high temperature in the bench.
5. To prescribe the quantity of gas expected, and requiring a statement of what actually was produced from each charge.
6. Cleaning all ascension pipes every 48 hours.

It must not be believed that in doing this the gas engineer will be given an onerous amount of labor—something he did not have before—he has but the bother incident to putting the method in practice. Afterwards it is absolutely mechanical. It would please me if my colleagues would take up this matter and, by getting better returns, put me into the shade. I would regard that as the finest result of my efforts.

The Yield of Coal in Coking.

By Mr. Duncan Anderson, Jr., Dayton, Tenn.

It is desired in this note to call attention to a few points in regard to the yield and character of coke as obtained from the beehive oven, retort oven and platinum crucible respectively. By coke obtained from the platinum crucible is meant that obtained in the usual proximate analysis of coal.

It was noticed on comparing the average of daily analyses of coal, and of coke obtained therefrom, over a period of seven months, and representing a quantity of coal of about 70,000 tons, that the quotient of the ash in the coal divided by the ash in the coke was 0.707, while the actual yield of the ovens was 61.3 per cent.

For convenience let us call the figure obtained by the ash division the yield of the coal, and the figure obtained by division of the quantity of coke drawn by the quantity of coal charged the oven yield.

The coke contained on an average 2 30 per cent. of volatile matter, which would bring the yield of the coal to 69.10 per cent. of fixed carbon plus ash.

The yield of this coal in a platinum crucible was 68.50 per cent. of fixed carbon plus ash.

The yield of this same coal distilled at a bright red heat in a small wrought iron retort, containing three fourths of a kilo of coal was, on an average, 71.00 per cent. of coke, carrying 2.20 per cent. of volatile matter. The time occupied in the distillation was about four hours. This gives the yield of the coal in fixed carbon plus ash, 69.44 per cent.

The yield of another coal in the same retort under similar conditions to the first was 71 50 per cent. of coke, carrying 1.30 per cent. of volatile matter, or a yield of 70.57 per cent. of fixed carbon plush ash. This coal gave a yield of coke in the platinum crucible of 68.03 per cent.

These yields are brought to the same basis of fixed carbon plus ash for the sake of ready comparisons.

These figures show :

1. That there is little difference in the yield of the coal in coke whether coked in a platinum crucible, a retort oven, or a beehive oven.

2. That the oven yield is not the proper factor to use in calculating ash of coal into expected ash of coke.

3. That in coke making by the beehive oven the coke is attacked but superficially by the oxygen of the air and burned to ashes; the portions not affected by the air give a yield as would, of course, be expected of the coal, coked out of contact of the air.

Some very interesting experiments of Dr. W. B. Phillips in coking Alabama coals confirm these conclusions in every way. The articles describing these experiments are "Coking in Beehive a Oven" and "Alabama Coals in By-Product Ovens." The former is published in the *Engineering and Mining Journal*, Volume LXIV., Nos. 25 and 26, and Volume LXV., No. 3, also in "Iron Making in Alabama," Alabama Geological Survey. The latter is published in the *American Manufacturer*, Volume LXII., page 446, and in "Iron Making in Alabama," etc.

The coal used in both series of experiments was washed slack from the Pratt seam.

As described in his article, "Coking in Beehive Ovens," he charges three ovens with given weights of carefully analyzed coal, and determines the weights of coke yielded therefrom respectively and the analyses of the same

The yields of the ovens, one of 48 hours, one of 72 hours and one of 96 hours, were 58.78, 59.77 and 57.51 per cent. respectively, making an average of 58.68.

The yields of the coal were 69.44, 71.75 and 68.51 per cent. respectively in coke. These cokes contained 1.51, 1.71 and 1.06 per cent. of volatile matter respectively.

Reducing the yield for convenience to fixed carbon, plus ash, we get 68.39, 70.52 and 67.78 per cent. respectively, an average of 68.90 per cent.

The yield of the coal in a platinum crucible was 67.52 per cent.

In his article "Alabama Coal in By-Product Ovens," he finds the yield of this same coal in the retort oven was 70 7 per cent. of coke, containing 0 98 per cent. of volatile matter, making a yield of 70.01 per cent. of fixed carbon plus ash.

Let us set the results in tabular form for comparison, eliminating volatile matter :

Coal.	Yield of Coal in Beehive Oven.	Yield of Coal in Retort.	Yield of Coal in Crucible.	Beehive Oven Yield.
Pratt.....	68.90	70.01	67.52	57.26
Dayton *a*.....	69.07	69.44	68.50	59.90
Dayton *b*.....	....	70.57	68.03	....

Dr. Phillips forms conclusions from his experiments quite at variance with those induced by the writer. He notes that in the case of the 48 hour coke the per cent. of fixed carbon in the coke, after eliminating volatile matter, is 90 26, and that if all the so-called volatile matter of the coal should escape without depositing any of its carbon, and none of the fixed carbon should be burned, we would expect to find in the coke itself 90.14 per cent. "It would thus appear that the carbon burned in the oven is counterbalanced by the carbon deposited from the gases." He then states that this statement pre-supposes that the fixed carbon of the coke is of the same nature as the fixed carbon of the coal. This he concludes may be true, but it is more likely that the coke from an oven has relatively much more deposited carbon than the fixed carbon in the crucible, and, "taking everything into consideration, it would appear that the fixed carbon, as determined in the ordinary method of analysis, is not of the same nature as the fixed carbon of the coke."

Now the fact that the crucible coke and the beehive coke contain similar amounts of fixed carbon means that they contain similar amounts of ash (100—per cent. fixed carbon — per cent. ash); or, in other words, that the yield of the coal is about the same in both cases.

Although the writer is unable to grasp the connection in the steps of Dr. Phillips' reasoning, as, for instance, how his final conclusion is at variance with his first statement in accounting for the facts, it may be safely said that any theory of replacement of burned carbon is wholly uncalled for, and is disproved by the fact that for 6 parts of coke recovered from a beehive oven about 1 part is burned up, the coke recovered showing practically the same yield from the coal that it would if coked in a retort oven.

That there is more deposited carbon in the beehive oven coke than in the crucible coke is, of course, indicated by the fact that the crucible yield is lower on an average than the yield of the coal in the beehive oven; or, indeed, than the retort oven yield. The difference is, however, small, not exceeding 1.50 per cent. in the experiments noted, and is likely to be partly due to access of air to the coke in the crucible. To this extent the fixed carbon of the beehive oven coke would differ from the fixed carbon as found in the crucible.

The same error has been noticed in two other places :

Sir Lowthian Bell, in his "Manufacture of Iron and Steel," page 49, speaking of the waste of coke by beehive oven coking, says: "The coal of the county of Durham may be regarded as containing 30 per cent. of volatile substances; or, in other words, as being capable of furnishing 70 per cent. of its weight of coke. As a matter of fact scarcely 60 per cent. is the average yield, implying that one-seventh of the desired product is lost." In the calculation of heat lost in coking 100 kg. of coal by this method, besides the item, "30 kg. hydrocarbons," there is included "10 kg. of solid carbon."

W. H. Blauvelt, in his article on by-product coke ovens in the "Mineral Industry" for 1895, and again in a paper before the Alabama Industrial and Scientific Society in 1897, makes the following statement, which the writer has not seen challenged :

"As an illustration of the difference of yield resulting from the difference in method of coking, a good yield of coke from Connellsville coal is 65 per cent., while in a good retort oven it is easy to get 75 per cent. Of course this increase diminishes proportionately the per cent. of ash, phosphorus, etc., remaining in the coke."

It suffices to call notice to the fact that the yield of the coal in the beehive oven is practically the same as in the retort oven.

The Cost of Electricity in Buildings.

Engineering Record notes that a collection of records and tests of a number of isolated electric plants in various types of buildings in New York city was made the basis of a paper, by Mr. Percival Robert Moses, before a recent meeting of the American Institute of Electrical Engineers. The paper was presented to put on record data as to the cost of electricity in such plants and an abstract is given herewith. According to the author, the cost of supplying electricity in a building plant is the difference between the cost of supplying the other requirements of the building, the electricity being purchased outside, and the cost of supplying the other requirements of the building and electricity from private plants, the cost in all cases to include interest and depreciation,

reckoned at 5 per cent. each. Money was invested in a plant and could generally be replaced at an interest charge of 5 per cent. The plant might be considered worthless in 15 years, as an average case, and enough must be put aside yearly to repay this amount of its cost. Five per cent. per annum with interest at 5 per cent. would equal the original investment in 15 years.

The first building taken up was a hotel 15 stories in height. It contains 11 electric elevators, four of which are high-speed screw elevators, compound engines, directly connected to generators, water tube boilers operating at 125 pounds pressure, and a complete refrigerating and ice making outfit, besides all usual apparatus and laundry machinery.

The cost of the electricity in this hotel is the difference between the cost of operating plant with the electric generating apparatus and the cost without. A depreciation and interest charge on about one-fifth of the boiler and steam piping should be added, as about four fifths of the boilers installed would have been necessary without the plant. This amounts to about $500 per year. Without going into the question of what the total cost of operating this plant is, there are certain items, such as lamps, cylinder and machine oil, engine and dynamo repairs and packing, which may be directly charged to electricity. In the item of labor, if an electric plant were not in operation, one engineer, two firemen and two oilers could be dispensed with—about $3,600 per year.

The question of amount of coal used per kilowatt hour in this plant depends entirely on the season and the amount of current supplied. If the exhaust steam from the engine is insufficient to meet the heating requirements, additional lighting makes no appreciable change in the amount of coal used. During warm weather or when the steam for lighting exceeds the amount required for heating, the amount of coal used increases in proportion to the electricity supplied. The curve of coal per kilowatt hour would therefore be similar to the curve of steam generation, *i. e.*, it would be almost straight, until the heating requirements were met, and would then rapidly increase for additional kilowatt hours supplied. This variation is illustrated by the accompanying table.

From April 25 to May 2 the hotel lighting was supplied by the Edison Company, the elevators and motors being supplied from the isolated plant. From May 4 to May 11 the whole installation was supplied from the isolated plant. As the temperatures for the two weeks were nearly the same, the work, other than the lighting, may be considered about constant, and the difference in the average amount of coal used charged to the electricity supplied. In March and January coal per additional kilowatt hour may be estimated in a similar manner, although as the Edison service was not used the differences are not so great and the deductions are therefore liable to large error.

Interval.	Kilowatt Hours, Total.	Coal Pounds.	Coal per Additional K.W. Hour.	Average Load Kilowatt.	Average Temp. at 6 P.M. °.
May 4–11.....	15,200	221,000	....	83	57
April 25–May 2.....	6,400	195,000	....	28	61½
Difference.....	8,800	26,000	2.95	..	..
March (2–6) (14–18)....	20,250	339,000	....	105	43
March (6–14).....	18,600	329,000	....	97	44½
Difference.....	1,650	12,000	7.25	..	..
Jan. (15–22) (29-Feb. 5).	36,000	608,000	....	107	32½
Jan. (1–8) (22–29).....	33,660	593,000	....	101	31½
Difference.....	2,340	15,000	6.4	..	..

This table shows the kilowatt hours supplied during two sets of seven days each in May, two sets of eight days each in March and two sets of 14 days each in January. As the work done other than the electrical is about constant during any pair of sets of days, the difference in amount of coal used is chargeable to the electricity supplied. Inspection of the table shows that throwing the lighting load on the Edison service from April 25 to May 2 reduced the coal used by less than 3 pounds per kilowatt hour. As the actual coal per kilowatt hour in the non-heating season is between 3½ and 4 pounds it is evident that during the period, April 25–May 2, the exhaust steam was insufficient to heat the building, and also that the additional 8,800 kilowatt hours supplied, after the Edison supply was cut off from May 4 to May 11, were not a direct charge on the coal pile. The results in March and January are, as stated, subject to large errors, but they serve as an indication of the influence of heating. It is evident from the table that in January and March the exhaust was in excess of the steam required for heating, while the contrary was the case from April 25 to May 2, when the Edison current was in use. The coal chargeable to electricity is derived as follows :

The current supplied from April 25 to May 2 (excluding Sunday) was approximately equal to that supplied from May 4 to May 7 and also from May 8 to May 11. By combining these figures and eliminating the electric factor, a rough idea of the constant requirement is obtained and proves to be about 24,000 pounds of coal per day, exclusive of electricity at this mild season. The coal per kilowatt hour is the difference between the total coal used and the constant coal requirement, divided by the number of kilowatt hours. The total coal used in 25 days in July was 700,000 pounds. The constant demand, 550,000, leaving 150,000 pounds for the electricity; as 41,500 kilowatt hours were supplied, this gives a figure of 3.62 pounds per kilowatt hour. In January, in 14 days, 608,000 pounds of coal were used, and subtracting the constant coal, at 35,000 pounds per day, equal to 490,000 pounds, leaves 118,000 pounds for 36,000 kilowatt hours, or 3.27 pounds per kilowatt hour. The average for the year will not exceed 3 4 pounds per kilowatt hour.

The total kilowatt hours per year exceeds 825,000. The cost of electricity in this hotel is as follows : Coal, $4,075 ; labor, $3,600 ; sundries (lamps, repairs, supplies, etc), $3 000 ; total, $10,675. Adding for interest and depreciation $3,000, increases amount to $13,675. Cost per kilowatt hour is, exclusive of interest and depreciation, 1.3 cents ; inclusive of same, 1 66 ; coal per kilowatt hour, 3 4 pounds ; cost of coal per kilowatt hour, 0 5 cent. By the introduction of an automatic stoker and a storage battery and the use of cheap coal with proper provision for ensuring good combustion, this figure could be further reduced, but it is pretty nearly low water mark for electricity, as supplied from an isolated plant

A smaller hotel, 75x100 feet, with an L 25x100 feet, 7 to 8 stories in height, has had a plant in operation only a few months, but a log of coal, amperes and other plant items is kept hourly.

The cost of heat and elevator operation had been found to be $3,600. The cost of installing generating and refrigerating plant was $5,000—a plant to meet the present conditions and maintain a proper reserve would have cost $7,500, on which an interest and depreciation charge of $750 is ample. The present cost of operation is : Coal, 3½ tons per day, at $2.75, $3,500 ; labor, 4 men, $2,000 ; oil, waste, lamps (estimate) $300 ; ammonia, $50 ; water, $500 ; total, $6,350. Interest and depreciation, $750 ; total cost, $7,100. Previous cost, $3,600 ; cost of electricity, refrigeration and steam for kitchen, $3,500.

The light used averages 2,500 ampere hours per day at 118 volts, equal to 2,150,000 16-candle power equivalents in a year. The refrigeration varies from 1½ to 2 tons per day, ice melted equivalents equal to 640 tons per year. The cost of these two items at 0.3 cent per 16-candle power equivalent and $3 per ton for ice would be $8,370 per year. This shows a net saving of about $5,000 per year by the isolated plant.

To obtain a figure for the cost of electricity in this plant the cost of water used for condensing the ammonia gas into liquid ammonia, the interest and depreciation on the cost of refrigerating apparatus and the cost of ammonia must be deducted. These amount to $650. By a test made on the refrigerating machine, the author found that 50 pounds of steam per hour per ton actual refrigeration was sufficient to allow, and on this basis the coal used for refrigerating amounts to about 100 tons, or $275 in the year—the hours of operation being averaged from the log records. The labor increase may be divided between the electric and refrigerating apparatus in proportion to the coal used—*i. e.*, four-fifths and one-fifth.

The cost of electricity supplied was found to equal $2,645. The cost per kw. hour is $2,645 × 20 ÷ 2,150,000, 2.45 cents ; coal per kw. hour 900,000 × 20 ÷ 2,150,000, 8 37 pounds ; cost of coal per kw. hour, 1.17 cents. A force pump system of oiling with filtering device was used on the engine, and, it is stated, has amply proven its value by reducing the consumption of machine oil to less than one quart per day, about 0.00025 of a cent per kilowatt hour.

To obtain the cost of electricity in apartment houses, two typical examples were chosen. The first is a 7 story apartment house, 100x100 feet, with 38 apartments, a small restaurant, having two hydraulic passenger elevators and one hydraulic freight elevator and a belted electric light plant. The latter operates only at night and until 1 o'clock. One engineer and a fireman during the day, and one man at night constitute the entire staff ; the repairs have been nothing for the past five years.

The total cost of operating the steam and electric plant is $4,309. In a similar apartment house having one hydraulic elevator and steam heating and outside electric service the steam plant costs $2,401. The cost of elevator and light service is therefore about $2,000 per year. The total installation is 900 incandescent lights and the average load from 5 until 12 is 500 lights, reduced in summer to about 350. The total number of kilowatt hours supplied by this plant is over 55,000 The cost per kilowatt hour and the coal and cost of coal per kilowatt hour

Type of Building.	Type of Plant.	Cost Per K. W. Hr. Including Int. and Dep.	Cost Per K. W. Hr. Excluding Int. and Dep.	Coal Per K. W. Hr.	Cost Coal Per K. W. Hr.	Kind of Load.	Approximate Annual Total, K. W. Hrs.	Apparatus Supplied.
Large hotel.....	Compound.	1.66 cts.	1.30 cts.	3.4 lbs.	0.50 cts.	Fluctuating.	825.000	11 elevators, kitchens, refrigerating and laundry machinery, ventilating and heating and lighting, pump.
Small hotel.....	Simple.	2.45 "	1.94 "	8.37 "	1.17 "	Steady.	100,000	2 elevators, kitchens, refrigerating and heating, pump.
Apartments.....	"	4.70 "	3.80 "	7.00 "	0.88 "	"	55,000	3 " " lighting, " " " "
Department store....	"	2.85 "	2.35 "	9 25 "	1.45 "	"	200,000	4 " cash blowers, laundry, lighting and heating, pump.
Small store.....	"	4 10 "	3.60 "	12.80 "	1.90 "	"	50,000	1 " lights.
Large office bldg.....	"	4.37 "	3.42 "	9.40 "	1.36 "	Fluctuating.	158,000	4 " " ventilating, heating.
Small " "	"	5.06 "	3.81 "	7.25 "	0.93 "	"	40,000	2 " " heating.
Loft building.....	"	2.60 "	2.00 "	8.00 "	1.02 "	"	100,000	4 " engine, lights, heating, pump, motors, dye vats, el. heaters.
Loft and office	Edison.	Power 6.66 " / Light 17.29 "	.....	.....	.....	.....	30,000 / 15,000	3 elevators, lights, pumps, heating.
Loft building.....	"	8.6 "	.....	.....	.....	.....	70,000	3 " "

may be found in an accompanying table. The cost at present wholesale rates would be over double the above figures, about 9½ cents per kilowatt hour from the central station.

In another apartment house of the same size, a low pressure heating boiler is used with electric elevators. The cost in this plant, exclusive of light and elevator power, was $1,700. In an apartment of the same size the cost of heating and electricity for elevator and lighting from the isolated plant was $4,590. Deducting $1,700, found as the cost of heating and supervision, from $4,590, leaves $2,890 as the cost of elevator power and lighting. As the power for an electric elevator from the central service would not cost over $250 per year, a kilowatt hour of light from this style of plant is evidently more expensive than one with hydraulic elevators and an electric light plant, and unless some means of equalizing the load is employed, this is undoubtedly the case.

The figures for a department store, where the total kilowatt hours supplied from the plant was over 200,000, and the cost of installation, including additional boilers, was not more than $20,000, show that the cost of electricity was $4,675. Including interest and depreciation of $1,000, the cost was brought to $5,675. The interesting figures may be found in the table.

In another store the total kilowatt hours were estimated at 50,000 per year, and cost of electricity calculated as $2,119. This brought the cost per kilowatt hour less than 4.1 cents. Three hundred and twenty tons of coal were used, or 12.8 pounds per kilowatt hour. The cost of coal per kilowatt hour was 1.6 cents.

In the Hartford building, corner of Eighteenth Street and Broadway, a careful and complete system of records is kept, even to the number of minutes the elevators are in actual operation. Following is a table from the records:

Total lamp-hours, light, 1 year	2,000,456
Total horse power hours, power, 1 year	77,869
Total horse power hours, light and power	211,233
Total coal used, pounds	2,025,700
Coal per E.H.P. hour, pounds	9.6
Total coal per E.H.P. hour, summer, pounds	9.4
Total coal per E.H.P. hour, winter, pounds	11.7

To obtain the cost of electric light and power, the cost of heating and operating, without reference to light and power, must, it was stated, first be determined. The coal for heating such a building would be about 210 tons a year. To retain the same class of service as at present, one engineer could be dispensed with. This leaves 1,600,000 pounds of coal chargeable to the electric plant and one engineer, to which must be added oil, waste, etc., Edison and fixed charges. The cost of electricity in this building, including interest and depreciation, is $7,000. The cost per kilowatt-hour, 4.37 cents; the coal per kilowatt-hour, 9.4 pounds.

The cost on central service would be 9.5 cents per kilowatt-hour for light, and 4.5 cents per horse power hour for power, and the total, $12,000 for light and power, a balance in favor of the isolated plant of $5,000 per year above interest and depreciation. The use of a storage battery as an equalizer and to take the night load would reduce the total above to about $6,250 per year, reducing the cost per kilowatt-hour to 3.9 cents. The amount of time the elevators are actually using power varies from one fifth to one-sixth the total hours in commission and the power used in the field, five-sixths of which is wasted, amounts, it was stated, to about twice the power used to operate the cars.

An example of loft building was had in one 10 stories high, 55 x 200 feet, having two passenger and two freight elevators, all electric, an electric pump and a number of motors. The cost of heating the building and supervision was $1,600 per year. The total cost of light, heat and power was about $5,800 per year. The plant consists of three 33 kilowatt direct connected sets, supplying light and power from the same bus bars at 240 volts; as there was only room for the old boiler, a breakdown connection was arranged with the street.

The cost of electricity in this building varies from 1.75 cents per kilowatt hour, in heating weather, to 2.07 cents per kilowatt hour in non-heating weather, exclusive of fixed charges, which amount to 0.6 of a cent additional. The total kilowatt hours in January were 11,550, in April, 10,250, of which about 2,500 kilowatt hours per month are due to elevators. The total coal used per kilowatt hour in January was 13 6 pounds. The total coal used per kilowatt hour in April, 11.6 pounds. The increase due to heating, about 15 per cent. If the coal previously used for heating is deducted, the additional coal per kilowatt hour, the coal used for electricity was about 6.8 pounds in January and 8.7 pounds in April.

If an equal amount of electricity to that at present supplied were purchased, the cost on the central station service would be $8,200. The balance in favor of isolated plant, on basis of equal amount of electricity supplied, is over $4,000 per year in this case. This balance, it was stated, would be increased by the installation of a storage battery, costing about $5,000, by avoiding the necessity of Edison service and by furnishing absolutely steady load to the engine, which would reduce the coal used by nearly 20 per cent.

The author believed that several important facts were brought out in this building: First, an isolated plant can be operated at a profit at rates lower than those of the central station, even on a wildly fluctuating elevator load, and a light load of short duration. Second, the isolated plant service is a benefit to both tenant and owner. Third, through the isolated plant, and only by this means can the use of electric heating appliances be brought to its full development. Fourth, the central station cannot compete, in so far as cost is concerned, with the isolated plant, where skilled attendance is otherwise required and steam heat is necessary.

The data for cost of electricity for an office building were taken from one 13 stories high, 50 by 30 feet. It contains two drum elevators, two engines belted to 40 kilowatt generators and one horizontal tubular boiler. Night service is supplied by the New York Light, Heat and Power Company. The coal used varies from 1,863 pounds per day in summer, to 2,007 pounds in winter. One engineer and one fireman run the plant, and the cost of heat, light and power, exclusive of night lighting and power, is less than $2,500 per year. The cost of electricity in this building is $2,025. The average current for lighting is 35 amperes and the yearly kilowatt hours, 22,000. The power required by the two elevators is not less than 18,000 kilowatt hours per year, and the total power at least 40,000 kilowatt hours per year.

The author also considered two buildings in which there was no electric plant, one containing 1,500,000 cubic feet and the other 500,000 cubic feet. Each had two electric passenger elevators and one electric freight elevator. These buildings are the last two in the table.

The author thought it would appear from these figures that the central station had no mission to fulfill, except that of supplying breakdown service and service to small buildings, and yet it was hard to reconcile this with the enormous annual increase in the gross receipts and net returns of the central stations. While it is true that a properly designed plant would, under good management, furnish current in a building of fair size at a cost of from 2 to 4.5 cents kilowatt hour, everything included, it was not always advisable to install a plant. In many clubs, restaurants and other places, where quiet was absolutely essential, or where space was limited, or valuable, a saving of a few thousand dollars was not of sufficient moment to make it worth while.

He thought that a continual decrease in the prices would be made by the central station, as their business increased; but a similar decrease was going on in the isolated plant, both from the increase in knowledge of the requirements, and the increase in the use of electrical apparatus, uses which were largely stimulated by the cheap supply. He also be-

lieved that there are very few plants that would not welcome the central supply of steam.

The discussion on the paper was opened by Mr. H. Ward Leonard, who believed that an allowance of 5 per cent. for depreciation was insufficient. While you could borrow money at 5 per cent., you could not borrow money at 5 per cent. on the ordinary isolated electric light plant, and if you were going to invest money in an electric lighting business as a speculation you would not be apt to invest your money when the maximum return possible would be 5 per cent., in view of the risk. His own opinion was that 15 per cent. would not be all too much to allow for the interest and depreciation charge on a modern isolated plant.

He thought that about 3 cents per kilowatt hour was close to what could be done in an isolated plant to-day. While he thought it incontestable that under favorable circumstances a large isolated plant could produce electricity at a price such that the central station company would have difficulty to compete with it, he also believed that a great many isolated plants were being operated at a higher cost than the central station company could afford to take for the service. He considered that the whole question boiled down to the value of the heat of the exhaust steam as against the economy of production on a very large scale by a central station over a small plant. Where the value of this heat is large, the isolated plant would necessarily have an advantage. A central station plant, he thought, should be able to produce a kilowatt hour at a very much lower rate than it could be produced by an isolated plant, if the exhaust steam was disregarded. Instances seemed to be developing, he stated, where the owner of an isolated plant found that he could purchase from a central station steam to operate an isolated plant cheaper than he could operate his plant by himself, and it would look, he thought as though in an average case the question of cost would be in favor of the central station, provided the central station were able to sell its current for a 24-hour service and consequently at a low rate.

Mr. Arthur Williams said there were many instances in his experience which went to show that the kilowatt consumption of a building was a very unsafe factor to determine the relative cost of central station and private plant supply. He presented a number of figures to show the superiority of the central plant, and thought that the results of the author were in many cases misleading.

The author in his closure noted that his figure of 10 per cent. for interest and depreciation charges had been strongly objected to. He still adhered to it, for the following reasons: While he would not advise any client to invest his money in an electric plant unless more than 10 per cent. clear was assured, yet he considered 5 per cent., or even 4 per cent., as ample to allow for interest charge, as this is in excess of the actual amount an investor or owner of a building would pay for the money required to replace the capital invested in plant. As regards depreciation charge, he allowed an average of 5 per cent. per annum, which, with interest at 5 per cent., would equal original capital in 15 years, for depreciation on the whole installation, which includes boilers, piping, pumps, engines, dynamos, foundations, alterations to existing building, boiler setting and alteration to wiring. This allowance was excepted to on the ground that no plants last 15 years. He said he could cite dozens of existing plants where boilers had been in daily operation for over 20 years and were still allowed to carry from 60 to 80 pounds pressure, and many engine plants had been running for the same length of time.

The author did not think, as did Mr. Leonard, that the question of the paper depended on the comparative value of the heat obtained from exhaust steam and the increased efficiency of the large engines in the central stations. The value of the heat from the exhaust steam, while important, was not, in his opinion, the deciding factor. A few of the reasons why the building plant could manufacture and deliver electricity cheaper than the central station, in addition to the benefits of use of exhaust steam for the heating, were that in the building plant little or no additional labor is necessitated by the addition of an electric plant, and such labor was always cheap. In the central station, labor for firing, for running engines, keeping books, collecting bills, inspecting outside and internal constructions, testing meters and selling current were direct charges on electricity.

It is said that the Nevins syndicate, which recently secured control of the Haverhill (Mass.) plant, is attempting to purchase the properties and goodwill of the Lowell (Mass.) Gas Light Company. The bid price is said to have been $400 per share, but there is no reason for believing that such an offer will be accepted. In fact we doubt if $600 per share would be taken.

[From *Engineering*.]

American Competition.—No. I.

By Col. E. A. Stevens, President, Hoboken Ferry Company, Hoboken, N. J.

[No other industrial question at the present time has so keen an interest to British manufacturers as that connected with American competition. It has been brought prominently into public notice on more than one occasion during the last six months, but for several years past our manufacturers, merchants and shippers have been unable to close their eyes to the fact that since the United States have recovered from the effects of the great panic of 1893, they have steadily become more dangerous antagonists, not only in this country, but in foreign markets, and especially in those markets which we have been accustomed to regard as our own. It is still urged by not a few persons that this competition is factitious; that in order to take away our customers, goods are supplied by enterprising Americans at a loss; that the articles forced on the markets of the world in preference to our own are of inferior quality, and will not stand the test of time and use, and that this spurious phase of manufacture and commerce is but transient. But those who are able to take a broader view know that such statements are fallacious; they know that in many manufactured products the United States can beat us in price, and at least equal us in quality; they know that at present, and still more in the near future, the struggle of competition will grow keener, and that the advantages of this struggle do not lie with us. The causes of these advantages are probably not understood by any one person, though the results may be keenly felt by all, and we believe that we shall be rendering a service of the highest value to British manufacturers if we are able to throw some light on the many aspects of a complicated problem. To this end we have invited the co-operation of a number of prominent Americans and Englishmen to speak on the subject as they think best, each approaching it by his special path of knowledge and dealing with it as he may think most useful. We are convinced that such a collection of authoritative views, to be supplemented, we hope, by the free expression of opinion in our correspondence columns, will prove of value to our industrials; will teach them where America is strong and where we are weak, and the converse will suggest what methods we may modify or adopt to our own profit; and will prove that the true way to overcome an adversary is not to despise him, but to be familiar with his strength.—Ed. E.]

The cost of manufacture may be divided as follows: Material, labor and an additional charge to cover the cost of management, the interest and depreciation of plant, the profit of the manufacture.

In the past the United States have been at a disadvantage in all three respects. Materials were dearer, manufacturing processes had not advanced far enough to enable the average manufacturer to realize as much for the wages paid as his foreign competitor; interest rates were higher than in England, and the American was not content with the same profit that would satisfy an Englishman.

But these conditions have passed away, whether because of protection or in spite thereof it would be useless to discuss. The struggle has been a long and hard one—a system of railroads unequaled by any other nation in mileage and in cheapness of service has been built, the processes of manufacture have been improved, the mechanic has been trained, the methods by which his muscle and brain are applied to his work have advanced, money has become cheap, and the manufacturer, freed by his ability to compete with the world from the risk of ruin, with which a change of administration and tariff laws a few years ago threatened him, has to be, and is, content with a smaller return for his risk.

Capital now seeks investment in the so called industrials, and at rates of profit which show that the investor at least believes the present conditions to be permanent. The prevailing mania for trusts in almost every industry is but an exaggerated expression of the confidence which the nation feels in its manufacturing power; and this confidence resting, as it does ultimately, on wonderful natural resources, and on the skill and common sense of the American mechanic, is not a misplaced one.

The cost of labor is fixed by the mechanic's skill and personal qualities, as modified by surrounding conditions, including the tools with which the work is done, trade unions, etc., the skill with which the shop is managed and the rate of wages.

I deliberately place the latter in the last place. My own experience leads me to prefer the highest-priced mechanic. I understand, that in England there is no such difference in wages of mechanics in the same

shop as we are used to, and therefore there is less incentive for a man to make himself of greater value to the shop; if I be right, the English mechanic is handicapped, and whatever his personal worth and skill may be, is placed under conditions clearly unfavorable to the full development of his powers. In other words, he is not worth so much to the man that hires him.

It is my clear conviction that I can get more work for one dollar in the United States than I could in England, and this independent of any question of management.

Let it be clearly understood that this assertion is not a slur on the ability of the English workman. It is at once admitted that the English workman is the equal of any, but not if he is in England; in other words, the British workman at home is not as good a man to employ as when he is in the United States; but why is this so? Many will answer that trade unions are responsible; others that better tools and appliances are given him in America, or that he receives better wages; or again that the air is dryer and he can do more physical work; but the writer asserts that, while admitting all these reasons to have weight, the great and grand one is that in America his ambition is absolutely uncurbed.

He recognizes that he can aspire to almost any position; that his ability is quickly recognized, and that, a journeyman to-day, he may to-morrow become a foreman, and a proprietor the next. The average workman in America applies his intelligence to his work more effectively than his English brother. He comes to the shop to learn his trade far more self reliant; during his apprenticeship he has the great advantage of having about him Frenchmen, Germans, Englishmen, Swedes; in fact, he has many of the advantages of travel while remaining at home. A good English workman when he comes to America shows very quickly a change for the better; he takes more interest in his work, he sees he is free to use his brains, and that he can profit by their use.

A question almost always asked by the writer of the recently-landed English workman who applies for work is, what daily newspaper he reads at home, and the answer is rarely that he reads any. While a renowned British engineer was in the writer's works, I asked how many of his 800 men read daily or trade papers? The answer was not 10 per cent.; in contrast to this, the writer's 118 men read 233 newspapers daily. In short, it is contended that the working man's condition in England is such that he is not willing to give, and does not give, for an English penny paid him as good or as much work as he will give in America for two cents; and what is more, he never will until he is in the same position in England as in America.

An ironmaster known the world over, and thoroughly acquainted with American and English labor, lately remarked in speaking of the prospect of successful American competition shipbuilding:

"I will contract to put down all the steel needed in an Atlantic coast shipyard at lower prices than it can be had in any British shipyard; if, with this advantage and with American labor, you cannot beat the English shipbuilders, it will only be because you are not man enough to handle such an undertaking. It only needs the right man, and there are plenty of them in this country."

High wages in themselves are not a drawback. If the mechanic's output warrants the best pay, and if he feels that he gets the highest wages, because he is the best workman and earns most for the shop, the better he is; and the more he is paid the more profitable will he prove to the manufacturer who is able to make use of him. But it takes something more than willingness to pay high wages to enable a manufacturer to profitably employ the highest grade of labor, and this brings us to the consideration of the result of skill in the handling of labor as it affects the cost of the latter.

All successful modern manufacture must rest on a highly developed system, which latter is impossible without discipline.

Notwithstanding individual cases, there appears, as a rule, a marked difference in the method of discipline in Great Britain and the United States. In the latter there is less demand for blind and unreasoning obedience, a greater reliance on the subordinate's understanding of the need of obedience, and consequently more intelligent action on his part. Suggested improvements by mechanics, and even by apprentices, are a daily thing with us; they are welcomed and encouraged, and are often of great value. I understand that, as a rule, in England such suggestions are not eagerly welcomed.

Let us go a little into details. I will suppose that a new design of machine is to be given out in my shop. When the fact becomes generally known, the entire establishment, from office boys to superintendent, takes interest in the matter; and there is no hesitancy on the part of the employees to suggest modifications of design or alterations in processes of manufacture. Most suggestions from the workmen are in the direction of cheapening the work, or of simplyifing the various mechanical operations. It must be noticed that the time required for any operation is generally known; the reason for this is plain, as the workman sees that if he produces a piece of work more quickly than his fellow workman, his chance of an increase of pay is good, in fact a sure thing, and he prides himself on his superiority. Many American workmen will notify their foreman that they will run out of a job in an hour or so, thus making the foreman's work much easier. This illustrates the striking thing about an American workman; his intense interest in his particular part of the work in hand. He is very sensitive as to his reputation, and if a part made by him does not fit, ninety times out of a hundred he will discover the reason for the mistake: and if it can be laid to any tool, he will report it. The tool box of a good American workman is probably never worth less than fifty dollars.

He does not want any roughly finished callipers or soft steel trisquares or common scales. He generally owns a micrometer, and uses it. Let it be clearly understood that all American engineering establishments are not filled with angels as workmen, as might be inferred from the foregoing. Jealousy, likes and dislikes, unfairness and meanness are unfortunately ever present; but the ambition which so characterizes workmen in America is a mighty leaven. This I firmly believe to be the great difference in industrial conditions here and in England.

But, turning from the man to the master, allow me to allude to one feature that has of late received some notice. The English manufacturer was long in possession of undisputed supremacy; during past years he has made changes and improvements, but as a rule they have not been radical, and when they have been so, they have met with bitter resistance from his men. His success, however, has been wonderful. He has naturally come to consider his methods the best; under them for years he has beaten the world, and he reasons that he will keep on doing so. He may not, as a rule, have the overweening confidence in his superiority, and the indifference to the needs of his customers, often considered by foreigners characteristic of his kind, but he would be more than human if his unchallenged leadership, aided by the inborn conservatism of his race, had not developed in him a tendency to those faults, and a satisfaction with his own methods and his own product.

In isolated cases these causes may lead to the assertion that, because a thing has been produced in one way for generations, that therefore this is the best way to-day. Such isolated cases are of importance only if they are really exaggerations of a generally prevailing feeling. At best, past success and opposition by labor, place the British manufacturer at a disadvantage in adopting new tools and new methods.

The American, on the other hand, is not thus hampered. If it be suggested that he can build a steam engine on the same methods as a lathe, or a boiler with machinists and pipe fitters, he has a free mind to weigh the value of the suggestion, and if his judgment be in favor of the practical application, he has less fear of his attempt being thwarted by contentions with his men.

He has had a long struggle with adverse conditions. The strictly home market to which he has been restricted until a few years ago was artificially stimulated, with the inevitable result of over-competition. Hard times, rendered needlessly harder by a vicious financial system, weeded out the weaklings, drove strong firms into consolidation, and weaved a system of specialization which I believe has never been approached elsewhere. I can best illustrate it by comparison of the celebrated Crewe shops with those of the Baldwin locomotive works. At Crewe the material is all received in a raw state, and leaves in the form of almost every article used on a modern railroad. It is said that the Baldwins never make anything they can buy as well, and make nothing but locomotives.

We reason on this side of the Atlantic that the specialist will beat the other fellow, who may have spread himself out a little too thin; and acting on our reasoning we seem just now to be making a little money. Before we could do so, we had to create great shops in which to obtain our results and capital to carry them. Specialization has brought intensified thought and application. We drive tools harder, we want to wear them out faster, and keep abreast of the times by replacing them with new ones. All of these differences are not growths of a day. They are the results of national developments along different lines. Their causes lie deep in each nation's life. In both cases the raw materials of which manager, engineer and mechanic are made, are the best. Years alone will prove which nation has made the most of her sons.

(To be Continued.)

The Problem of Municipal Ownership.

By Mr. Martin A. Gemunder, of Columbus, Ohio.

During the last 10 or 15 years I have read and examined many articles, books, editorials, reviews and statements touching upon this problem of municipal ownership. Such examination has disclosed the fact that the main arguments pushed forward, one way or the other, are drawn almost exclusively from tables and statistical matter. I fully recognize the validity of this method for drawing conclusions, but when it is further noticed that figures and tables flow so copiously from the pens of the representatives of both sides to the controversy, each side frequently charging the other with unfairness, one can hardly help believing that either there is considerable uncertainty in the data presented or personal bias has guided the selection and grouping of the alleged facts After a careful review of the situation I am of the opinion that before trustworthy conclusions can be arrived at by means of this so called inductive method, examinations into fiscal statements and operations will have to be far more systematic, careful and exhaustive than they have been up to the present time, and I say this too with a full appreciation of the large amount of painstaking labor that has already been employed.

If municipal ownership and management are in the main productive of better results to the community than are private ownership and management, there must be some fundamental cause responsible for this gain. If on the contrary the reverse is true, then there must likewise be somewhere an agency at work which may be brought to light. In an attempt to sift the underlying factors—in an effort to show their value and the consequent direction in which lie the tendencies for the best results—this brief article will expend itself.

Leaving out of court all questions relative to the true functions of a government, what it should or should not do in order that there may be developed a healthful and independent citizenship, and taking it for granted, as most citizens apparently do, that within certain very broad and illy defined lines a government may properly undertake and carry out anything that a majority of the citizens deem for the public welfare; arguing on this basis the problem resolves itself into one of service and dollars and cents, or ultimately into one of dollars and cents only. It certainly matters little or not at all to the very large majority of the people who it is that supplies them with any needed article provided only that the quality and price are satisfactory. In other words, the question to be determined is: Can or cannot the official representatives of a community acting directly as producers and distributers secure for their constituents certain required services at a smaller sacrifice of earnings than when such services are furnished by private enterprise? That they can and actually do so is contended for by advocates of municipal ownership, and that they will not or cannot do so is the plea urged by the opposition. Let us examine the question as an abstract mathematical problem.

Assume a plant calculated to supply a municipality with gas, electric light or other similar commodity. If this plant is private property the subscribers to the capital stock would certainly expect returns on their investment exactly as would owners of dry goods, furniture, hardware and other business establishments. Interest on investments would then be paid in the shape of dividends. The cost to the consumer would be indicated as follows: Let X equal the cost, I the interest or profits, T the taxes, D the depreciation, N the insurance and E the operating expenses, and we will have the following equation: $X - I + T + D + N + E$.

Take now an exactly similar plant under municipal ownership and management and we will find the following: We have no stock subscription, but we have what would be practically the same thing, a direct assessment on the property holders for the means for carrying on the business, in the shape of tax levy. It matters not in the least whether the city issues its bonds or not for securing the capital, for the bonds are all ultimately in some way made good by taxes. The community is thereby deprived of the use of that much capital in its everyday life. Remembering too that many, if not a majority, of the people and taxpayers are not consumers at all of these particular commodities, and of those who are patrons the amount of patronage is very large in some cases and small in others without regard to the amount of taxes paid, then it becomes evident that this enterprise, though a public one, should yield a profit. The municipal plant should therefore exact from its consumers, as a part of the item of cost, interest on the investment at the current rate of business gains in the community, turning this gain into the public treasury as a rebate to the taxpaper. This method equalizes and corrects conditions between taxpayers and consumers. It prevents the sacrifice of one to the other.

It has been the almost universal custom to calculate the rate of interest against the municipal plant at the rate of interest at which a city can float its bonds. Personally, however, I can see no reason for this. The fact that a good city can sell its bonds on a 3 or 4 per cent. basis has nothing to do with the rates to be charged against the investment, for, as before stated, these bonds are all ultimately, in some way, taken up by the taxpayer. He furnishes and is deprived of the use of his money whether there has been a bond issued or not. There is no relation that I have ever discovered between a city's ability to borrow and the rate of interest to be charged against a municipal plant, when the loan is redeemed by taxation. The rate at which a city can temporarily borrow money is one thing, but the rate at which it can permanently appropriate capital is another. In the former instance it is merely a matter of credit—a probability that a given sum will be returned unimpaired at a given time—the rate of gain or interest being fixed, with no chance of a diminution. To all intents and purposes it is a guaranteed investment as far as the creditor is concerned. In the latter instance it means transferring capital from people's private to public affairs, hence it is self-evident that if the new investment, though in public hands, fails to yield the same rate of returns as the business from which it was withdrawn, a loss has been entailed. The real rate to be charged against a municipal plant would, therefore, be the average rate of profits in mercantile pursuits, for that is what the taxpayer loses when the government deprives him of his capital.

In enterprises employing large capital this rate may not exceed 4 or 5 per cent., but in the very large number of small concerns where the investment of a very limited amount of capital enables the owner at the same time to advantageously place his labor, 6 per cent. interest would, so to speak, cut no figure at all. For example, A with $2,000 capital starts a grocery. Being owner he is enabled to put in his own time as manager and salesman. If his profits at the end of the year are but $600, his capital would have been worth 30 per cent. to him. He would hardly have consented to parting with it for a 6 per cent. return. To charge a rate of less than 6 per cent. against a municipal plant I believe will lead to wrong conclusions.

It should here be noticed that if the average rate of business returns or profits is charged against a municipal plant and the profits of a private plant are not above normal, then there would be a substantial equality between the profits exacted by a private corporation and the interest to be charged against a public plant, a conclusion which is not sufficiently present to the minds of those advocating municipal ownership.

An industry in the possession of private parties pays taxes. Transfer it to the city and this source of revenue is lost to the municipality and must be made good by extra demands on the taxpayer. For the same reason that interest is charged up as an item of cost, so must also be figured in taxes and insurance. Operating expenses and depreciation will appear under municipal ownership as well as under private ownership. Our items of cost to the community would then under municipal ownership be interest, taxes, depreciation, insurance and operating expenses. If X' equals the cost, I' equals interest, T' equals taxes, D' equals depreciation, N' equals insurance, E' equals operating expenses, then we will have the equation: $X' - I' + T' + D' + N' + E'$.

Apparently this is the same equation we have under private ownership. Assuming profits to private parties to be normal, and management everywhere equally honest and capable, the equations would in fact be identical, or in other words, it would be a stand off between municipal and private management as to results, the one being no better than the other. Municipal ownership brings into play no new factor to make its labors more productive. It will hardly be necessary to state that the customary way of showing a success by merely indicating an excess of receipts over current expenses is very erroneous and misleading. It would not be followed by any one having knowledge of accounting.

Let us examine the two equations more in detail. Although on paper they appear as equivalents, yet, as all parties to the controversy would assert, they are not so in actual practice. Advocates for municipal ownership would take exceptions to the quantities I and I' being considered as equivalents, claiming that I, representing private gains, is so swollen by private greed as to far exceed in size the quantity I', representing current interest and profit rates. Advocates for private ownership would also contend that E', representing operating expenses under municipal ownership, owing to incapacity and dishonesty, inherent defects in the public service, is a quantity which very much exceeds in value the quantity E, representing operating expenses under private management.

As far as the comparative values of I and I' are concerned, I will en-

deavor to show later on that if I is, as a matter of fact, greater than I', it is simply the fault of municipal managers, a fault that can be corrected if proper methods are followed.

About the quantities E and E', representing operating expenses, much is to be said. Private management and excessive self interest or greed are always closely associated in the public mind. These traits, and it will be useless to deny that they are present to a greater or less degree in all private business ventures, instead of being faults, are the very factors we must look to for economical management. In order that the greatest gains may be realized, this so-called greed insists that work must be skillfully performed and expenses kept down. If this line of conduct is not maintained profits must fall off. All losses must be borne by the concern, for there is no accommodating taxpayer to make good deficiencies. In our day, where competition for the possession of the market is so sharp and severe, rigid economy in production must be the rule of action or the industry is necessarily forced to the wall.

In the public work no such deterrent is present. There is practically no going to the wall. An officer is elected or appointed for a given term, and unless his faults have been glaring indeed, he holds his place to the end. His good or his weak points are seldom known until he has stepped out of office and his actions have been reviewed by his successors.

If mistakes have been made, the taxpayer pays the bill and a fresh start is made under the new regime. As far as the personnel of office holders is concerned—well, every one knows how they are selected. Indeed, if but half of that which is said about us is true, then we are a sorry lot. In my opinion, however, the weak point in the public service is, not so much lack of character on the part of public officers, for I fully believe that there are few cities that have not at least some men in office whose reputations for integrity and capacity are above reproach. Shortcomings are traceable largely to inexperience, inexperience due to short terms of office.

In the city of Columbus, Ohio, for example, we have a department of public improvements at the head of which is a director. As prescribed by law, this director shall have the care, management and administration of the water works, shall fix the rates to be charged therefor, and collect the same; shall have the care of streets, avenues, alleys, highways, public grounds, parks, and the opening, improving, repairing and cleaning of the same; shall have charge of public buildings, bridges and structures of every kind; of sewers, drainage and dredging; of making and preserving all surveys, maps, plans, drawings and estimates relating to the public work under the charge of said department, and of all matters and things in any way relating to or affecting the highways, footways and waterways; he shall have the supervision and the exclusive control of the lighting of streets, alleys, avenues and public places and buildings of the corporation; all the powers heretofore vested in and performed by the trustees of water works, trustees of cemeteries, park commissioners, planting commissioners and civil engineers, shall be vested in and performed by the director of public improvements.

It would seem to the citizen of average intelligence that if experience were of value at any time or at any place it would certainly be here. Nevertheless, the head of this department, owing to the State laws and local differences in politics, has been changed four times during the last seven years, assistants frequently going out with the retiring director. To fully appreciate this state of affairs try and imagine the effect on the operating expenses and results of any private business organization of a turning out into the street every few years of its entire force, from president to porter, to make room for comparative novices. Fancy, too, the amount of enthusiasm and desire to excel that must be instilled in an employe by the knowledge that in all probability he will be dismissed in a year or two. Few will deny that a city must pay enhanced prices in order that it may obtain officers and clerks equal in ability and character to those found in private business honses. Enter any store or office, pick out a clerk who is receiving say $600 a year, ask him to take a political position at $800 or $1,000 a year and he will hesitate. He knows that after deducting his political assessment, his half-forced contributions to societies, dances, outings, church entertainments, persons in distress, raffle tickets, etc., there will be comparatively little left him except the certainty of losing his place altogether in a year or two. I venture the assertion that there is hardly a clerk in the public service who would not be willing to allow a liberal reduction to be made from his salary if he were freed from the above annoyances and allowed to retain his position as long as he satisfactorily performed his duties.

During the last session of the Legislature of the State of Ohio a commission was appointed to draft and report to the next Legislature a law for the organization of all cities, towns and villages in the State. Judge Pugh, of the commission, in a recent address to the Optimist Club, of Cincinnati, Ohio, made the following statement: "In regard to the momentous question of municipal ownership and control of street railways, telephones, lighting facilities, etc., there is but a remark to make. Till the merit system is firmly established, and in good working order, we are sentimentally opposed to such ownership and control. We are not indifferent to the argument that the public is just as capable of running its street cars, telephones and lighting business as it is its police and fire forces. It will be a happy day when this can be done and when the city grades its own streets, builds its sewers and other public works. But until city politics are purified of place trading and venal jobbers, till the political bosses are dethroned, we are in favor of conservatism on this subject of municipal ownership and control of street railways and telephones."

I am ready to admit that a good civil service law well enforced would materially improve the public service, yet I also insist that even this betterment would still leave it inferior to private service. A civil service law is defective in two points: First, owing to difficulties and red tape in the matter of discharge and removal, a tendency will prevail for retaining in office incompetents and fossils. Second, it affects mainly the clerks and does not protect at all the heads of goverment and department, the persons of all persons who should be thoroughly equipped with knowledge and experience. Most of the gentlemen present at this assembly are public officers and department heads. Every one of you will feel, I am sure, when your turn comes to step down and out, that you were just beginning to get affairs well in hand, and had you been permitted to remain longer in the harness you could have accomplished much for the public good. In other words, you were never accorded the opportunity of giving your city the best you were capable of. Really there is no more reason for applying the civil service system to clerks and sub-officers than there is for applying it to mayors and heads of departments. In a private organization no such inelastic, hard-and-fast rules prevail. As long as employer and employe find it profitable to remain together, so long will they work side by side. When association ceases to be mutually beneficial, ties are promptly severed. This is the only real merit system.

Any one reading the debates that took place prior to and during the adoption of the federal constitution cannot fail to notice the fear that pervaded the atmosphere of creating or fostering an official class. This feeling is still prevalent, hence short term presidents, mayors, councilmen, etc. As one prominent writer has said: "Whereas, any handicraft, such as boot-making, requires a long apprenticeship, yet the art of governing and making people's laws is easy. This comes by nature." Some such belief as this must govern the action of citizens, otherwise it is hard to explain the frequent changes sanctioned by the people. As a result of this promiscuous office-holding few of any cities have fixed financial or business policies. No opportunity is given officials who attempt new departures for watching results and correcting methods which time has shown to have been mistaken ones. Progress under such circumstances must needs be uncertain and slow.

But this is not all. Frequent changes in office entail inexperience and liability to err, to say nothing of increasing the chance for obtaining dishonest officials. The public has undoubtedly recognized this to a degree, and as a consequence the laws of the various States teem with enactments toward limiting the discretion vested in a public officer. To cite a single example by way of illustration. The laws of Ohio prescribe that in cities of a certain size no contract involving an expenditure of money to exceed $500 in amount shall be made without advertising for proposals for a period of two weeks. This provision is probably a wise one, brought out by bitter experience. But who would think of adopting any such cut-and dried rule for his own business. With prices fluctuating continually, and at times even to a very material degree, a law of this kind absolutely thrusts aside opportunities for taking prompt advantage of the state of the market while at the same time it encourages combinations and deals of which the city will be the victim.

In a private business, where a man is placed in a position of responsibility, the presumption is that he will faithfully labor for the welfare of the concern. In the discharge of his duties he is permitted to do anything that he sees fit, in the interests of the business, not outside of the rules of common honesty and prudence. There is no division of authority into legislative and executive. The president or manager is an autocrat whose career is only checked by failure in obtaining results. There will be little dissent from the statement that but for this almost unlimited power and discretion vested in private managers, the

productive forces of the country would never have reached their present high state of development.

With city officers a policy the reverse of the above is adopted. When they assume their duties the presumption evidently is that they are very fallible. Their duties and the manner in which they shall perform them are prescribed for them in minute details. Instead of being permitted to do anything but that which is expressly forbidden, they can only do that which they are expressly charged with doing. In thus curtailing their freedom to act as their sense of propriety may dictate, while they are thereby prevented to a certain extent from committing great sins, yet at the same time they are seriously hampered in efforts for securing the best possible results. Services under such conditions can never far exceed mediocrity.

[To be Continued.]

On the Manufacture of Nitrite of Soda.

By Mr. M. A. Darbon.

Details of the manufacture of nitrite of soda are very scarce in chemical literature; it will therefore be of interest to briefly describe the production of this substance, which is now very widely used in the dyeing industry. The raw material used in its manufacture consists of purified Chili saltpetre, and although the presence of sodic chloride may interfere with the value of the nitrite, the re-crystallization of commercial saltpetre, with a view to the elimination of the sodic chloride, is not practiced, as the expenses connected with the operation would be too great.

The saltpetre is melted in large cast-iron vessels, an operation which includes the evaporation of the hygroscopic water, and the decomposition of a part of the iodides and iodates which accompany the saltpetre. At 310° saltpetre begins to fuse, and before adding the lead necessary for its decomposition the temperature is raised to about 400—420°.

The lead should be as pure as possible, as the presence of small quantities of other metals might cause the decrepitation of the whole charge; it is, above all, antimony which is the most to be feared; the lead used must be in thin sheets. About 280 parts of lead are necessary for 100 parts of saltpetre. As soon as the melted saltpetre has reached the desired temperature the necessary quantity of lead is gradually added; at the same time the whole must be kept constantly stirred so as to obtain a very intimate mixture. It is necessary to carefully watch that the charge does not become too strongly heated, for fear the vessel might be pierced; in case of emergency, to prevent such an accident, a quantity of cold saltpetre must be added, or the fire withdrawn. When all the lead has been added the stirring must still be kept up for some time, and the melted mass is then removed by means of a large cast iron ladle. It is then run in the form of fine threads into cold water in which its solution is helped by constant stirring. The decomposition of the saltpetre by the lead at 420—500° has the effect of producing, besides the nitrite, about 1 per cent. of caustic soda, which dissolves a certain quantity of the oxide of lead formed; this latter should also be removed. This is generally effected by neutralizing with nitric acid; in this manner saltpetre is re-formed, while the oxide of lead is precipitated in the state of insoluble hydroxide. We may also use nitrite of lead or sulphuric acid for neutralizing the solution; sulphuric acid is preferable on account of its low price, but we then obtain sulphate of soda, which is deposited in the concentrating vessels in the form of the anhydrous salt. We thus have in aqueous solution nitrite, undecomposed saltpetre, caustic soda holding oxide of lead in solution, and the soluble impurities of the saltpetre, such as chloride of sodium, etc. The insoluble residue consists of oxide of lead, a very small quantity of metallic lead, which has escaped oxidation, and a certain proportion of peroxide of lead. The solution diluted to about 6—8° Baumé is neutralized with nitric acid (or dilute sulphuric acid, or again with a solution of nitrate of lead); the oxide of lead in solution is precipitated, and the addition of the acid is continued as long as a precipitate is formed.

We may here correct an error which has slipped into most treatises on chemistry; most authors state that nitrite of sodium has an alkaline reaction, but this is not the case—the pure nitrite is absolutely neutral.

The neutralized solution separated from the insoluble residue by any convenient method is concentrated in cast iron basins until it reaches 42—45° Baumé when warm.

The insoluble residue is thrown on a large filter of coarse material, such as sacking, washed with warm water, and the wash-waters added to the principal solution. The residuary oxide of lead is capable of various applications, which will be dealt with directly. The concentrated solutions are added together in cast iron vats and left to crystallize; if the crystals thus obtained are not pure they must be redissolved and re-crystallized. The pure crystals are separated in a centrifugal machine, washed, dried, and packed.

The desiccation takes place in an oven, the temperature of which is carried to about 50°, and the crystals are packed in cylinders of double thicknesses of parchment paper.

The residuary oxide of lead may be either melted and cast as it is, reduced to the metallic state, or transformed into minium; it can also be used for the preparation of white lead, of nitrate, acetate or other plumbic compounds.

The analysis of the nitrite is generally made with a titrated solution of permanganate of potassium. By dissolving 9.594 grms. of permanganate in 1 liter of water we obtain a solution, each c.c. of which is equal to 1 centigrm. of nitrite of sodium.

The analysis is carried out in the following manner: A known quantity of the nitrite is rapidly weighed and dissolved in an Erlenmeyer flask of 150—200 c.c. capacity with about 80 c.c. of water. To this solution are added a few c.c. of dilute sulphuric acid (1:4), and it is then titrated. When the coloration begins to disappear with difficulty, a fresh quantity of sulphuric acid, much stronger than the last, is added, as there is now no longer any danger of nitrous acid escaping. The addition of the permanganate is continued drop by drop until the rose tint is permanent for about a quarter of an hour.

To hasten the final reaction the solution may be heated towards the end of the operation to 30—40°. The analysis of the melted mass is carried out in the same manner as is that of the oxide of lead to see if the washing was thoroughly done.

The Chloride of Lime Process for the Purification of Acetylene.

The London *Journal* reports that Herr F. B. Ahrens, in a recent number of the *Zeitschrift für angewandte Chemie*, discusses the chloride of lime process for purifying acetylene. He points out that acetylene obtained from calcium carbide and water contains on an average 0.5 per cent. of impurities, of which certain sulphur and phosphorous compounds are the most obnoxious. To remove these compounds is the problem which is presented in the proper purification of acetylene.

Of the purifying agents which have been proposed, two—viz., Frank's solution of cuprous chloride in hydrochloric acid, and Ullmann's acid solution of chromic acid, either of which may be absorbed by kieselguhr, and thus applied in the solid form—have fulfilled their object in a reasonably adequate manner, but have not actually effected the quantitative removal of the impurities named. Chloride of lime, which was applied before either of these agents, alone removes phosphureted hydrogen and organic sulphur and phosphorus compounds completely from commercial acetylene. Therefore it has been freely used in conjunction with the acidified solution of calcium chloride, and ferric hydrate, for the purification of acetylene; but unfortunately it exhibits some objectionable minor reactions. It gives rise to carbonic oxide and chlorinated compounds. Crude acetylene, which is free from carbonic oxide, if passed through chloride of lime, and thence into a solution of blood, causes the latter to exhibit clearly the carbonic oxide spectrum. The quantity of carbonic oxide formed, however, is but small; and the application of chloride of lime would not be precluded on account of this action. But if the acetylene which has been passed through chloride of lime is consumed in a solution of potassium permanganate, a large quantity of chlorine will be found in the colorless filtrate. The amount will be much diminished if the gas be passed through lime after it leaves the chloride of lime. But gas purified by chloride of lime always retains organic compounds of chlorine, which would destroy or choke burners made of other material than steatite. In many cases, moreover, the acetylene thus purified has been found to have an intolerable odor of chlorine; and the lighting of the town of Vesprcem, for example, had to be temporarily suspended on account of the smell of chlorine in the houses. Another cause of interruption of working, also, is the sudden and intense heating up of chloride of lime purifiers, resulting in the material being soon rendered inactive.

Herr Ahrens considered that the reasons of the aforementioned objectionable behavior of chloride of lime as a purifying agent might be ascertained by investigation. He thought the heating might arise from a reaction between acetylene and chloride of lime, induced by a high proportion of active chlorine in the latter; but no heating ensued when he passed acetylene for a long time over the best chloride of lime. Even when the chloride of lime was maintained at a temperature of

nearly 212° C., there was no sudden or violent reaction, although evidently a consumption of acetylene took place. He next, therefore, took the material as it would ordinarily be used in practice—viz., fresh strong chloride of lime mixed with sawdust and moistened. The proportions of the several components of this mixture varied frequently; and it appeared that, with a certain quantity of water, heating occurred, and even a temperature of 266° F. was observed. This heating did not occur immediately after mixing, but after the lapse of a certain time, which was dependent on the proportions of the components of the mixture. It was attended by an exhalation of steam and chlorine. Both the heating effects and the odor of chlorine arise from the same cause, and the acetylene itself is not responsible for them. The complaint that chloride of lime is not of high purifying power is also to be traced to the same origin; and Herr Ahrens states that he has repeatedly satisfied himself that this material has really a very high efficiency as a purifying agent. He gives a table of the results of observations which he had made on the rise of temperature when chloride of lime, of 34 per cent. strength, sawdust and water were mixed in various proportions. Some of the more striking results are given in the appended abridgment of his table.

Grammes of—			Maximum Temperature Attained. Degrees F	Time in which the Maximum Temperature was Attained. Minutes.
Chloride of Lime.	Sawdust.	Water.		
30	20	5	113	10
30	20	10	156	50
30	20	15	248	4
20	20	10	257	17
20	20	15	253	5
20	10	9	266	7
20	5	5	99	—
20	5	10	120	10
20	5	12	257	4
7.5	20	10	160	7
7.5	20	20	174	2

In order to obtain direct evidence that the heating effects observed were due to a reaction between the hypochlorite (chloride of lime) and sawdust, a clear cold solution of chloride of lime was mixed with sawdust; and in a short time a temperature of 203° F. ensued. Parallel experiments made with finely divided pure cellulose, in place of the sawdust, did not show any remarkable rise of temperature. It must therefore be the lignin of the sawdust which reacts with the hypochlorite, and develops the great heat.

Herr Ahrens considers his researches prove that chloride of lime should, in order that objectionable reactions may be guarded against, be used mixed with much sawdust or with very little water; or that for choice the sawdust should be entirely dispensed with, and kieselguhr, coke dust, brick dust, lead chromate, or other material, be used in its place, to give a sufficient degree of porosity to the chloride of lime.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. CHARLES P. STETSON, a prominent lawyer of his State, and for a long time Director in the Bangor (Me.) Gas Light Company, died at his home in Bangor, September 29th. Deceased was in his 64th year.

ADVICES from Plainfield, N. J., of recent date, are to the effect that articles, incorporating the Peoples Gas Company, of Plainfield, have been filed by Messrs. William A. Coddington, Jas. E. Martine, George J. Tobin, Edward White, J. C. Smalley, Nelson Runyon, J. W. Johnson, J. H. McVey, V. W. Nash, H. H. Hammell, B. Gummere, Jr., W. C. Hendrickson and C. H. Cook. The Company is capitalized in $100,000, and its avowed object is to sell gas in Plainfield at $1 per 1,000 cubic feet; but to the general observer it looks that the scheme of the promoters is to cause the old Plainfield Gas and Electric Light Company to "sink its identity."

MR. W. S. WHARTON, Superintendent of the Bellingham Bay Gas Company, of New Whatcom, Wash., writing under date of September 22d, says, among other sentences: "While the gas plants in the East are flourishing it may be of some interest to you to know that business in Puget Sound is also on the increase, markedly so in the gas line when comparisons are made, which latter show this in respect of the month of August last as against August, 1898. In August, 1898, our make was 775,000 cubic feet; last August it was 2,500,000. This increase came about in the face of opposition from two electric light plants, one of which is operated by water power, the other having free fuel from a large sawmill operating under the same management, and supplying all-night 16 candle power incandescent lamps at the rate of 25 cents each per month, and 2,000 candle power arcs at $5.50 each per month. We feel like shaking hands with ourselves when realizing that we are still in the ring and growing faster than our competitors, with a gas rate of $2 per 1,000 cubic feet."

THE Van Wert (O.) Gas Light Company has increased its capital stock to $100,000.

MR. LIDDON FLICK, of Wilkes Barre, Pa., has been elected President of the Warren County (Pa.) Gas Company, vice Mr. John Franks, resigned.

A MYSTERIOUS sort of an incorporation is reported from Wilmington, Del., which is known as the Central Gas Light and Fuel Company. Its capital stock is returned at $150,000, its incorporators are Edward J. Canby, James L. O'Neill and Gardner W. Kimball, its declaration is to engage in the generation of gas for lighting, and its offices are in the building of the Delaware Trust Company, Wilmington, Del.

AT the annual meeting of the Seattle (Wash.) Gas and Electric Company these Directors were elected: H. C. Henry, M. H. Young, J. S. Goldsmith, J. W. Clise and C. R. Collins.

THE authorities of Belleville, N.J., have ordained that the Essex and Hudson Gas Company may pipe the streets thereof.

MR. EUGENE WAKEMAN has been appointed Superintendent of the Le Roy (N. Y.) Gas and Electric Light Company.

THE Directors of the Woonsocket (R. I.) Gas Company have perfected the following organization: President, J. B. Aldrich; Treasurer, Reuben G. Randall; Superintendent and Clerk, Z. M. Jenks.

MR. F. E. MOORE, for many years Treasurer of the Portland (Me.) Gas Light Company, has resigned that trust.

MR. CHARLES FINNING, for many years Superintendent of the generating plant of the Nashua (N. H.) Gas Company, died at his home in Nashua, the morning of September 25th. He was in his 75th year, and retired from active business about 10 years ago. He is survived by his wife and three sons.

THE Berlin Iron Bridge Company, of East Berlin, Conn., is erecting, at Baldwinsville, N. Y., between the towns of Van Buren and Lysander, a plate girder bridge, to be composed of 3 spans, 85 feet each in length. The roadway of the bridge is to be 30 feet in width, and the sidewalks are to be 7 feet in width. The structure will be a very substantial one, and the flooring is to be of buckle-plate carrying roadway. The bridge is designed to carry a double track, electric street railway in addition to the ordinary traffic.

SOME days ago the *Press-Post*, of Columbus, O., said: "The Director of Public Improvements of this city is preparing a statement of the cost per arc lamp of operating the new municipal electric light plant in connection with the West Side pumping station of the waterworks. The plant has been in operation for almost a year, and Director Kauffman thinks that sufficient time to test the efficiency and economy of the system has elapsed. He is of the opinion that the plant has not proven the success its promoters predicted for it. In fact the expense of operating the plant, based upon the number of lights furnished, is little if any less than the city is paying the Columbus Electric Light and Fuel Company under a contract which will expire about two years hence. The city is paying the private Company $73.50 per year per lamp. The supporters of the municipal plant confidently asserted that the expense per lamp would not exceed $50. Mr. Kauffman says the actual figures will show that it has cost the city not less than $70 per lamp, and possibly as much as $75 per lamp, of the 400 lamps in operation, to test the value of municipal ownership of publicly conducted electric street lighting. He adds, however, that this does not necessarily prove the municipal ownership plan a failure, for the reason that the Columbus plant is operated under great difficulties, owing to mistakes over its installing. He is pronounced in his belief that it was a mistake to attempt to run the plant by water power. It required over a million gallons of water each day to operate the turbine wheels, the pumping of which quantity of water is very expensive.

He says that if he remains Director of Public Improvements long enough he expects to install the proper kind of a plant for lighting the city." Meanwhile, the one in use is "improperly" performing a portion of the lighting.

THE Chicago *Tribune* says that Messrs. D. S. McMullin, W. Irving Osborn and C. T. Boynton, the Evanston (Ills.) capitalists who own the Waukegan (Ills.) Gas Company, have made plans for the extension of its territory. They propose to run a large main to the south, nearly to the Cook county line, with the object of supplying several small towns with gas. These towns include North Chicago, Lake Bluff, Lake Forest, Fort Sheridan, Highwood and Highwood Park. The Waukegan plant is of large capacity and its resources are sufficient to enable it to take up and carry on the supply contemplated when the piping is completed.

MR. ROBERT M. MORRELL, formerly Chief Auditor for the former Philadelphia City Gas Trust, and whose connection with that body was not held altogether blameless by the courts, died at his home in Ashland, N. J., the morning of September 28th. He was in his 65th year.

MR. GEORGE W. GRAVES, who for the past three years has represented the interests of the National Vapor Stove Company in the East, severed his connection with that concern the 1st inst. It is his intention to visit England, France and Germany with a view to investigating the gas stove business in those countries.

A CORRESPONDENT in Scranton, Pa., writing under date of September 28th, says: "Referring to your previous mention of a likelihood of a change in the ownership of the Consumers Gas Company, of Danville, Pa., let me say that your surmise was correct. The transfer will be completed October 1st, when certain residents of this city will succeed to the Bennett-Youngman interests. The purchasers propose to put the Danville plant in something like fair shape for trading, in which condition it has not been for some years."

MR. DAVID BUCK has been appointed Superintendent of the Consolidated Gas Company which we heretofore reported would operate the combined gas plants at Spring City and Phœnixville, Pa.

AT the opening of this term of the Massachusetts Institute of Technology, which began the 27th of last month, Dr. A. Rambeau delivered his first lectures as Professor of Modern Languages.

WORK on the plant of the Nelson (B. C.) Coke and Gas Company is well under way, but it is feared the pipe cannot be placed this season because of delay in deliveries by the contractors who agreed to furnish it.

THE United Gas Improvement Company is building shops "for repair purposes, etc.," at 9th and Dudley streets, Philadelphia. The Company is also constructing a stable at 8th and Mifflin street, same city. The constructors of both are Messrs. Wilson Bros. & Co.

THE purchasers of the Mount Holly (N. J.) Gas Company have agreed to retire for cash at an assessed price, all the stock and bonds chargeable to that Company and to the New Jersey Gas Improvement Company. The latter concern is to be dissolved and the new one will be operated under the old charter of the Mount Holly Gas Company.

THE report of Mr. Walter C. Allen, Electrical Engineer for the District of Columbia, covering the operation of his Department for the year ended June 30, 1899, has just been submitted to the District Commissioners. The Department was established by the Commissioners July 15, 1898, when the office in charge of street lighting and that portion of the office of the telegraph and telephone service engaged in outside work were consolidated into a single office, to be known as the Electrical Department of the District of Columbia. The new department was given supervision over the following named public interests: All matters pertaining to street lighting; the electric equipment of underground and overhead trolley roads; underground conduits for electric lighting and power, telephone, telegraph and other purposes; all overhead wires and poles, and exterior work relative to the District of Columbia fire alarm telegraph and telephone service. The scope of this new Department was further enlarged April 17, 1899, by another order of the Board of Commissioners, placing the remaining portion of the telegraph and telephone service within its jurisdiction. Mr. Allen's report is a most voluminous one, consisting of nearly 100 pages of typewriting. Under the head of "Incandescent Electric Lighting," he says: "No extensions of this service have been made, except the addition of 5 lamps placed temporarily around a break in the wall of the Chesapeake and Ohio canal on the Canal road. Owing to the fact that these lamps are on overhead lines, and a large number on each circuit, frequent interruptions have occurred, leaving whole sections in darkness until the trouble has been repaired. In Eckington, where 106 lamps are maintained, the whole service was interrupted 4 times during the year, and partly on 10 other occasions. On the Aqueduct bridge, where 36 lamps are maintained, all the lamps were out on 8 different occasions. On the Canal road, where 19 lamps are maintained, they were all out on 3 different occasions. In Tenleytown and vicinity, and on the Tenleytown road, where 112 lamps are maintained, there were 11 occasions when from 20 to 65 lamps were out at one time. Except in certain locations where it is impracticable to maintain either gas or naphtha lamps, as, for instance, on the Aqueduct bridge, where strong winds prevail, this service is not so satisfactory as gas. A single break in a wire will put out a large number of lamps, while with gas such an interruption does not occur. The use of ornamental lanterns for street designation purposes on corners lighted by arc lamps has been extended as far as the funds would permit, 31 being added to the 15 already in service." Respecting the arc lighting service, Mr. Allen says: "The electric arc lamp service was extended by the addition of 27 lamps maintained by the United States Electric Lighting Company and 33 lamps maintained by the Potomac Electric Power Company. During the year the United States Electric Lighting Company put its new central station in operation. In the old plant it operated the majority of the public arc lamps from Thomson Houston dynamos averaging 50 lights to each machine. In the new plant the latest type of Brush machines are used, averaging about 100 lights each. The underground circuits have been changed and connected together, but a large amount of the cable has been unable to withstand the increased voltage, and many interruptions to the service have occurred. The Company has drawn in considerable new cable, however, and is now engaged in weeding out the poor sections of the old. The Potomac Electric Power Company has adapted all the Adams-Bagnell lamps, formerly maintained 8 in series on a 600-volt grounded railway circuit, to the regular series arc light circuit and now operates them from standard arc light dynamos. This was done to comply with the requirement of the Department that all electric arc lamps should be operated on non-grounded circuits. The number of lamps of all kinds in use on July 1, 1899, as compared with July 1, 1898, was:

	1898.	1899.
Gas	6,295	6,455
Collis	15	46
Naphtha	1,257	1,215
Incandescent	268	268
Arc	598	658
Welsbach	....	57
Total	8,433	8,699

Increase during the year, 266 lamps."

THE Directors of the Seattle (Wash.) Gas and Electric Company, whose election at annual meeting is reported on the preceding page, have perfected the following organization: President, Mr. H. C. Henry; Vice-President, Mr. M. H. Young; Secretary and General Manager, Mr. C. R. Collins. The annual report showed that the increase in gas sales for 1898–99 over the corresponding twelvemonth of 1897–98, amounted to 25 per cent., and the increase over the output for 1896–97 was 133 per cent. Thirty per cent. of the current sales may be charged to use on fuel account. The Company has 4,200 meters in use, and its mileage of mains is 53. Manager Collins is satisfied, and so are his associates.

AT the annual meeting of the United Association of Journeymen Plumbers, Gas Fitters, Steam Fitters and Helpers, held in Peoria, Ills., as per announcement, the officers chosen were: President, J. S. Kelley; First Vice-President, J. H. Connolly; Second Vice President, Thomas J. Flynn; Secretary and Treasurer, W. J. Spencer. The next meeting will be held in Newark, N. J., next October.

THE voters of Santa Clara, Cal., by a ballot of 368 for to 152 against, have authorized the authorities to bond the town in $30,000 for the purpose of constructing and operating a gas plant on municipal account.

THE Toronto capitalists, who proposed to construct a gas works at Rossland, B. C., have been unable to enlist the interest of moneyed men in the scheme because of the numerous restrictions in the charter. The latter may be revised. If it is not changed the works will not be constructed.

THE Tennessee Gas and Coke Company has not yet succeeded in securing control of the old Knoxville Gas Light Company.

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PROPRIETORS.

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MONDAY, OCT. 9, 1899.

No Check to the Advance in Prices.

Iron Age says that the sentiment is widespread among both producers and consumers that a moderate reaction in prices, if it could be accomplished, would be extremely desirable. Values have now reached such an altitude, as compared with those to which the trade had grown accustomed for several years, that the situation is viewed with considerable apprehension. Evidence to this effect is continually cropping out. On all sides one hears the question, How long is this state of affairs going to last? The upward movement has continued without a break ever since last autumn, and the probabilities point to still higher prices as strongly as at any time. But no reasonable being can expect such a movement to go on indefinitely. The culmination will be reached some time. But if it is to be reached at much higher figures than now prevail, the result will clearly be serious financial loss and possibly commercial disaster on a large scale. Business is adjusting itself as rapidly as possible to new conditions.

Merchants and manufacturers have sold or worked up their low-priced stocks and inventories if taken now would show a sharp advance all along the line as compared with a year since. Much more of an advance would bring with it anxious days and perhaps sleepless nights for fear that a sudden drop should take place, catching high-priced stock on which a serious loss would have to be made in marketing it. Other considerations also have their effect on the trade, causing further advances to be deplored, but this is the most general.

It is easy to point out something wrong, but it is not always easy to suggest a remedy. Those who most heartily favor a reaction in prices are often part of the multitude who are co-operating in putting them higher. They continue to buy, and as long as the combined wants of buyers are equal to or in excess of the supply just so long will prices not only remain firm, but advance. The advance can only be checked by a general discontinuance of buying or by the concerted action of sellers. The former seems to be impracticable until all pressing wants are supplied, and the latter seems equally impracticable, because no seller can be expected to voluntarily present his customers with part of the proceeds of his own business.

As the law of supply and demand operates remorselessly in reducing prices, notwithstanding combinations and agreements, so does it seem to operate equally beyond human control in the other direction. We will probably see the present boom run its natural course and end in a period of stagnation while values are being readjusted. But that period we firmly believe will be of short duration this time.

One phase of the situation in copper is giving thoughtful men in the industry considerable concern. For some time past there has been a difference which is close to 1 cent per pound between the prices of Lake and electrolytic brands. The fear is expressed—and there is some justification for it—that this difference in the price will induce an increasing number of consumers to experiment with electrolytic copper with the result that they will learn to handle it effectively. In other words, many of those whom conservatism has still kept firm in the ranks of consumers of Lake copper exclusively will waver in the faith, and that when the present pressure for supplies has passed the spread between Lake and electrolytic copper will be permanently carried down to a much lower figure than it has ever been.

History Repeats Itself,

The *Sci. Am.* says that the experiment which is being made on the Boston & Maine Railroad with the use of coke as a fuel for locomotives calls to mind the fact that this was the only fuel used for the purpose when railroading was in its infancy. If our readers should chance to come across any engravings purporting to show the early trips of such locomotives as the "Rocket" and contemporary engines, which represent these little engines with dense volumes of smoke rolling from their smokestacks, they may be sure that the pictures were not drawn from the spot.

The advantages of coke as a fuel for locomotives because of its cleanliness, splendid heating qualities, absence of clinkers and dirt, not to mention its smokelessness, rendered it an ideal fuel to meet the legislative restrictions of those early days. One of the few objections to it was that the fierce heat engendered in the fire boxes frequently caused trouble by burning out the fire bars. The Boston and Maine Railroad officials have spoken in the highest terms of the behavior of coke in their locomotives, its chief recommendations being that it is smokeless, dustless and completely averts the great risk from setting fire by sparks and hot cinders. It is estimated by the management that this last advantage alone will result in the saving of about $100,000 which has been annually paid in the way of compensation for such fires.

The Market for Gas Securities.

The high rates for money, which seem to be largely if not altogether of the artificial sort, have kept the stock market in a decidedly unsettled condition, with the general effect on the list that prices for the past week were lower.

Gas shares, however, especially those of the city, save New Amsterdams, rather more than held their own. Consolidated crossed 191, and subsequently sold at 189, but the demand for carrying on short interest account precluded sales for the decline. On the surface the situation remains the same, but small straws point to the fact that the magnates are working earnestly for a truce pointing the way to a compromise. The opening for Consolidated to day (Friday) was 188 to 190, with a very dull market. Amsterdam common sold below 28 during the week; to-day it is 28¾ bid. Other city shares are dull and steady.

Brooklyn Union is firmer. That Company's earnings this winter will be equal to the dividend on its shares for a year. Peoples of Chicago is in less demand than heretofore, but those who buy it at present figures on or for investment account will have no cause to regret such action. Baltimore Consolidated is dull and lower without any reason therefor. Bay State is lifeless, Lacledes are steady, and Western, of Milwaukee, is often inquired for. The general list is strong.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks,

16 WALL STREET, NEW YORK CITY.

OCT. 9.

☞ All communications will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$39,078,000	100	188	90
Central Union, Bonds, 5's.	3,000,000	1,000	107½	108½
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	273	300
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	
New Amsterdam Gas Co.	13,000,000	100	28⅝	29¼
Preferred	10,000,000	100	52	54
Bonds, 5's	11,000,000	1,000	96½	98½
Northern Union, Bonds, 5's.	1,250,000	1,000	95	97
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	109	111
" 1st Con. 5's	1,500,000	..	112	114
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	111	115
Preferred	5,000,000	100	120	128
Bonds, 1st Mortgage, 5's	1,500,000	1,000	112	114
Yonkers	299,65	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	138	140
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	1⅝	1¾
" Income Bonds	2,000,000	1,000	..	75

Binghamton Gas Works...	450,000	100	40	..
" 1st Mtg. 5's.....	450,000	1,000	95	98
Boston United Gas Co.—				
1s Series S. F. Trust....	7,000,000	1,000	92	..
2d " " "	3,000.000	1,000	68	71
Buffalo City Gas Co.....	5,500,000	100	8	9½
" " Bonds, 5's	5,250,000	1,000	84	85
Central, San Francisco.....	2,000,000	..	105	..
Chicago Gas Co. Guaranteed Gold Bonds.....	7,650,000	1,000	104	104¼
Columbus.....	1,144,700	100	70	75
1st Mortgage.....	1,207,000	1,000	106	108
Consumers. Jersey City....	2,000,000	100	100	..
" Bonds.....	600,090	1,000	107⅛	110
Cincinnati G. & C. Co.....	8,500,000	100	194	194½
Consumers, Toronto.....	1,700,000	50	230	235
Capital, Sacramento.....	500,000	50	..	35
Bonds (6's).....	150,000	1,000	..	..
Consolidated, Baltimore...	11,000,000	100	60	60⅛
Mortgage, 6's.....	3,600,000	..	..	118
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's....	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	21	23
" Con. Mtg. 5's.....	380,000	1,000	87	90
Consolidated G. & E. Co.'s., Little Falls, N.Y.....	90,000	100	..	100
Bonds.....	75,000	..	..	100
Detroit City Gas Co.....	4,560,000	50	99	99½
" Prior Lien 5's.....	4,546,000	1,000	94¼	94½
Detroit Gas Co., 5's....	423,000	1,000	99	99½
" Inc. 5's.....	31,000	100	..	..
Equitable Gas & Fuel Co., Chicago, Bonds.....	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	77	83
" Bonds.....	2,000,000	..	80	85
Grand Rapids Gas Lt. Co..	1,000,000	50	..	..
" 1st Mtg. 5's.....	1,125,000	1,000	..	..
Hartford.....	750,000	25	..	220
Indianapolis.....	2,000,000	..	122	128
" Bonds, 6's.....	2 650,000	..	105	106
Jackson Gas Co.....	250,000	50	50	..
" 1st Mtg. 5's.....	250,000	1,000	96	100
Jersey City.....	750,000	20	225	275
Lafayette Gas Co., Ind.....	1,000,000	100	68	70
Bonds.....	1,000,000	1,000	81	86
Louisville.....	2,570,000	50	106	108
Laclede, St. Louis	7,500,000	100	65	66
Preferred.....	2,500,000	100	98	100
Bonds.....	10,000,000	1,000	107	108
Madison Gas & Elec. Co....	400,000	100	82	85
" 1st Mtg. 6's.....	350,000	1,000	102	..
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co.....	16,000,000	..	50	60
Bonds, 6's	4,600,000	..	107	108
New Haven.....	1,000,000	25	280	300
Nashville Gas Lt. Co.....	1,000,000	50	110	..
Oakland, Cal.....	2,000,000	..	53⅛	55
" Bonds.....	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago.....	25,000,000	100	110⅜	110¼
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage....	20,100,000	1,000	111½	112
2d "	2,500.000	1,000	104	105
Peoples, Jersey City.....	500,000	50	215	..
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred.....	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	70	73
St. Paul Gas Light Co.....	1,500,000	100	50	52
1st Mortgage 6's.....	650,000	1,000	82	85
Extension, 6's.....	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	80	82
St. Joseph Gas Co.....	1,000,000	100	42	44
" 1st Mtg. 5's.....	750,000	1,000	96	99
Syracuse, N. Y.	1,750,000	100	12	15
Bonds.....	1,612 000	1,000	81	84
Washington, D. C	2,600,000	20	280	..
First mortgage 6's.....	600,000	..	..	..
Western, Milwaukee	4,000,000	100	99	100
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Wilmington, Del.....	600,000		220	250

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The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Oct. 14, 1899, to stockholders of record at the close of business Sept. 30. Checks will be mailed.

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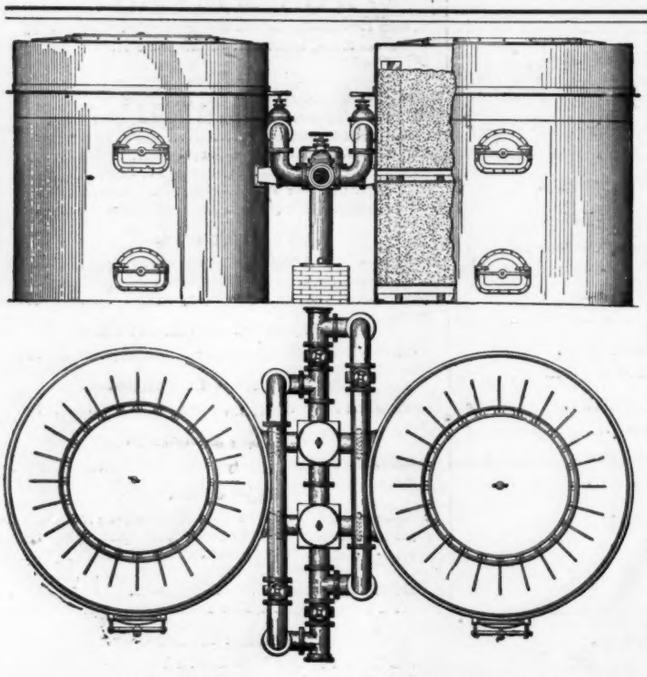

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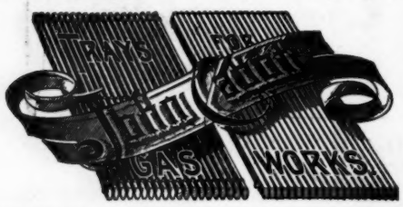

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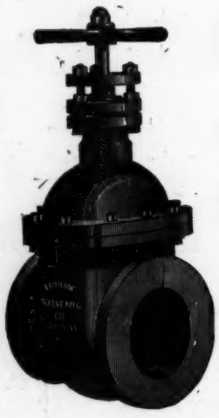

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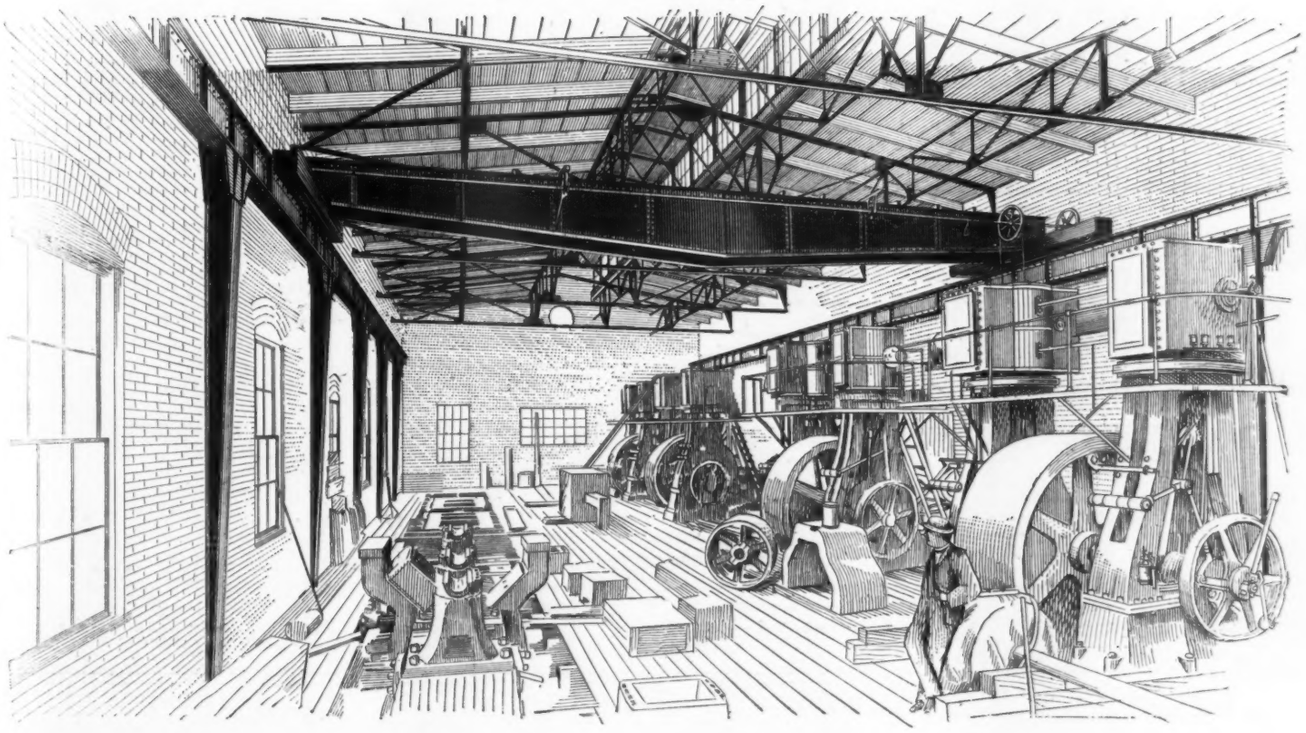


The above illustration is taken direct from a photograph and shows the interior of Power House designed and built by us for the Worcester Traction Company, at Worcester, Mass. The building is 47 feet wide and 120 feet long, with a traveling crane as shown. The roof being very flat, it is covered with plank, tar and gravel. The entire framework is of steel, a light brick wall being placed between the posts to protect the interior of the building from the weather.

BOSTON OFFICE, 200 Equitable Building.
NEW YORK OFFICE, 718 Bennet Building, Cor. Fulton and Nassau Streets.

Main Office and Works, EAST BERLIN, CONN.

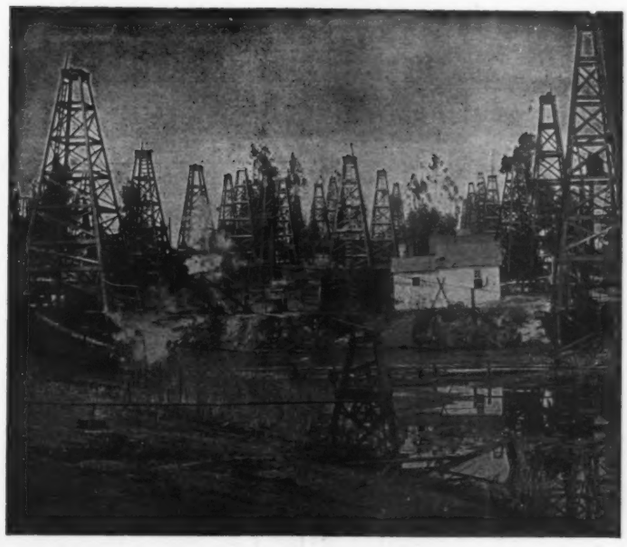
Gas Investments in California.

Nowhere else on this continent does such opportunity exist for profitable gas investment as on the Pacific Coast, since the perfection of the new LOWE Process for using the heavy crude California oils (of which there is an unlimited supply) without the use of any other fuels. Seven years' test proves the system to be perfect in every respect. Los Angeles alone, in addition to present street mains, has 150 miles of well built up streets without a gas main on them. To occupy this territory, and a large number of other towns now without gas, we have organized a parent company and a number of local companies covering some of the fastest growing cities in the United States.

Now is the time to invest, when the first capital will be able to double itself in a single year. This is also the most delightful residence section in the United States.

We suggest to those desiring gas investments, in large or moderate amounts—with or without active business connections—to come here and investigate; or, what is the next best thing, write us for particulars and prospectus.

The accompanying cut shows the oil wells in the suburbs of Los Angeles from which the Companies under the NEW LOWE GAS PROCESS obtain their supply of oil.



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406 Bradbury Building, Los Angeles, California.

AMERICAN GAS COMPANY

Constructors of Coal Gas Apparatus.

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Exhausters, Blowers, etc.

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GEORGE G. RAMSDELL, General Manager. **Correspondence Solicited**

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SOLE UNITED STATES AGENT FOR
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Gas Enriching Plants to Enrich Coal Gas up to 24 Candle Power, and Making a White, Bright, Non-smoking Gas

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Eastern Agents: AMERICAN GAS CO., Construction Department, 222 So. 3d St., Phila., Pa

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LATEST IMPROVED GAS EXHAUSTER

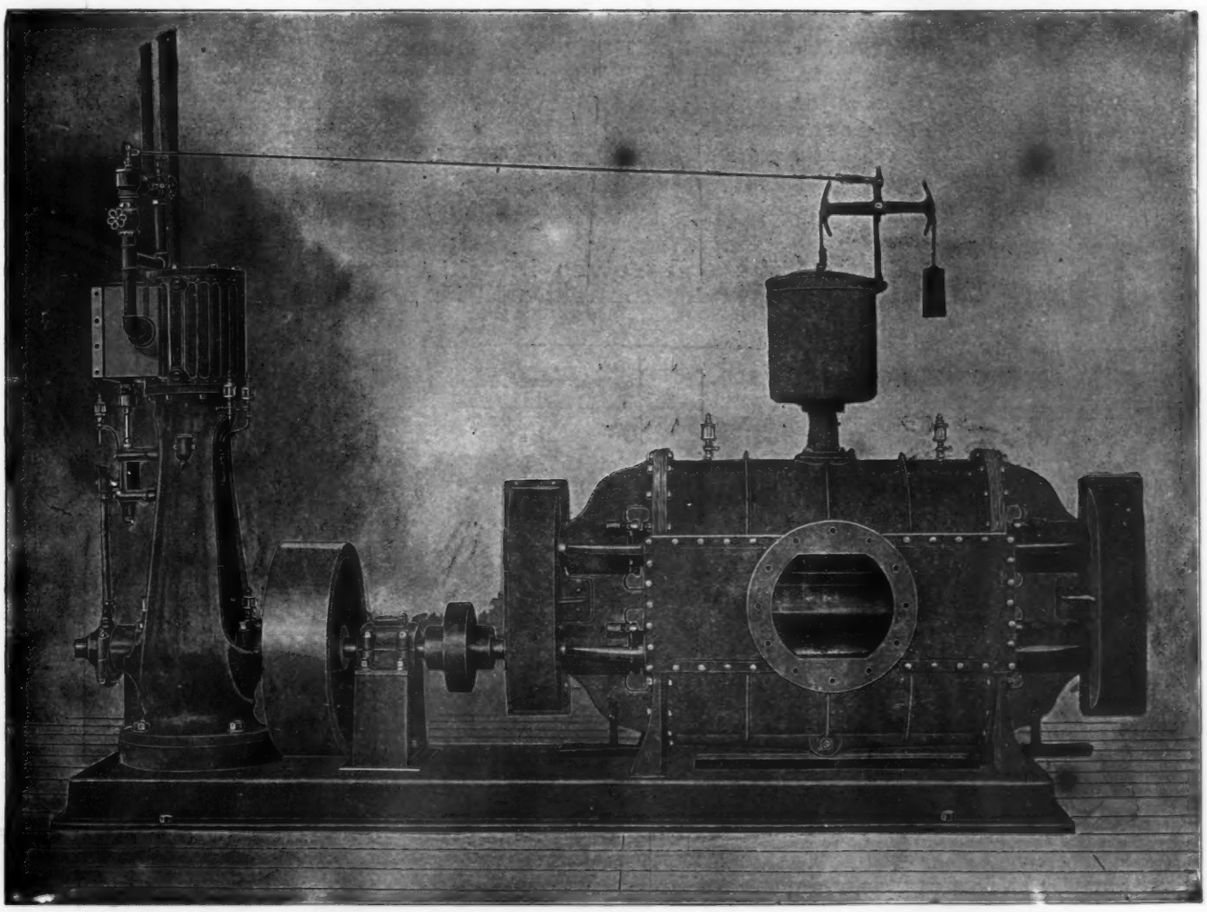
—AND—

NEW GAS GOVERNOR AND STEAM VALVE.

GUARANTEED TO REGULATE WITHIN ONE-TENTH OF AN INCH, WATER PRESSURE.

The Most Perfect Gas Governor on the Market.

MORE DIRECT IN ACTION. FEWER PARTS.
EASIER TO ADJUST THAN ANY OTHER GOVERNOR.



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Connersville, Ind. 109 Liberty St., New York.

Eastern Office:

American Gas Company,

222 South Third Street, Philadelphia, Pa.

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—OWNS, CONTROLS AND OPERATES—
EXCLUSIVELY

THE NEW IMPROVED AND PATENTED STREET LIGHT BURNER.

STYLE No. 81.

Our PATENTED "STREET LIGHT APPLIANCES" have made WELSBACH STREET LIGHTING a complete success.

By the UNIFORM DISTRIBUTION of light on scientific principles a greater area can be lighted by our system and more economically than in any other way.

Where there are no gas mains already laid, we can furnish an equally good light by our **SELF-GENERATING NAPHTHA WELSBACH BURNER,** enabling Gas Companies to furnish a uniform light in all localities.

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This Edition of the "Handbook for Gas Engineers and Managers" is a great improvement on all previous editions Much of the text has been re-written, in order to keep the work abreast of the constant advances that are being made in the Gas Industry.

PRICE, - - $6.00.

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With Instructions for Care and Working of the Same.

By G. LIECKFELD, C.E.

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Price, $1.00.

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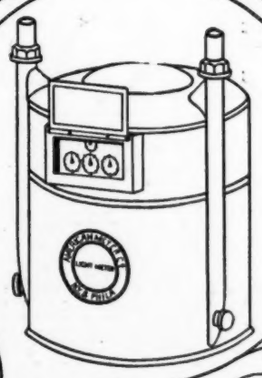
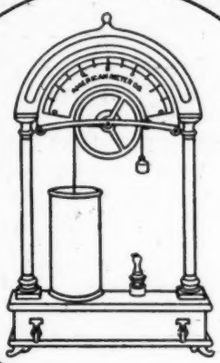
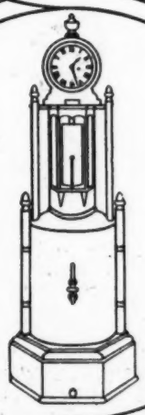
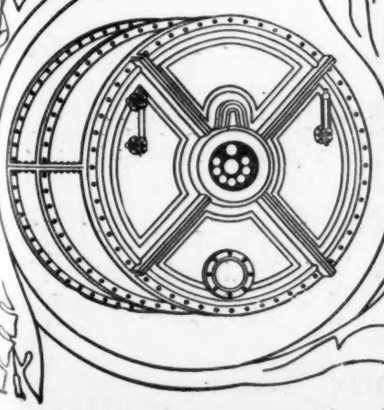








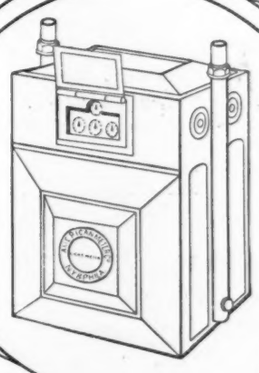
PUBLIC LIGHTING TABLE.

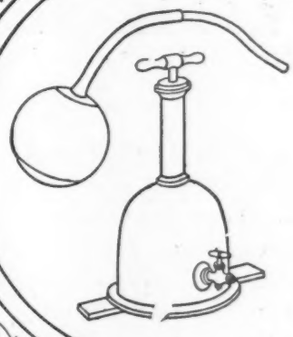
OCTOBER, 1899.

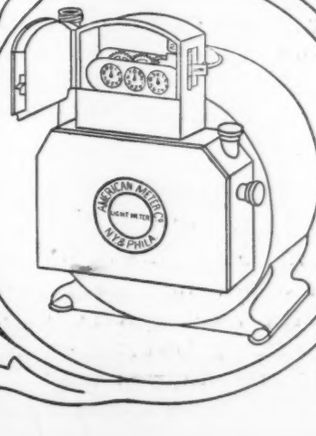
Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Sun.	1	6.10 PM	5.00 AM	5.30	5.00
Mon.	2	6.10	5.00	5.30	5.00
Tue.	3	6.10	5.00	5.30	5.00
Wed.	4	6.10 NM	5.00	5.30	5.00
Thu.	5	6.10	5.00	5.30	5.00
Fri.	6	6.10	5.00	5.30	5.00
Sat.	7	6.10	5.00	5.30	5.00
Sun.	8	6.00	5.10	5.20	5.10
Mon.	9	7.30	5.10	5.20	5.10
Tue.	10	8.30	5.10	5.20	5.10
Wed.	11	9.40 FQ	5.10	5.20	5.10
Thu.	12	10.50	5.10	5.20	5.10
Fri.	13	12.00 AM	5.10	5.20	5.10
Sat.	14	1.10	5.10	5.20	5.10
Sun.	15	2.30	5.10	5.10	5.20
Mon.	16	3.40	5.10	5.10	5.20
Tue.	17	No L.	No L.	5.10	5.20
Wed.	18	No L. FM	No L.	5.10	5.20
Thu.	19	No L.	No L.	5.10	5.20
Fri.	20	5.40 PM	7.10 PM	5.10	5.20
Sat.	21	5.40	8.00	5.10	5.20
Sun.	22	5.40	8.50	5 00	5.30
Mon.	23	5.40	9.50	5.00	5.30
Tue.	24	5.40	10.50	5.00	5.30
Wed.	25	5.40 LQ	11.50	5.00	5.30
Thu.	26	5.40	12.50 AM	5.00	5.30
Fri.	27	5.40	1.40	5.00	5.30
Sat.	28	5.40	2 40	5.00	5.30
Sun.	29	5.30	3.40	4.45	5 35
Mon.	30	5.30	5.30	4.45	5.35
Tue.	31	5.30	5.30	4.45	5.35

TOTAL HOURS LIGHTING DURING 1899.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	215.40	January	423.20
February	184.40	February	355.25
March	187.40	March	355.35
April	166.50	April	298.50
May	158.00	May	264.50
June	140.50	June	234.25
July	150.30	July	243.45
August	168.30	August	280.25
September	179.50	September	321.15
October	213.20	October	374.30
November	217.00	November	401.40
December	238.10	December	433.45
Total, yr.	2221.00	Total, yr.	3987.45







OFFICE OF THE

Welsbach Light Co.,

BROAD AND ARCH STREETS,

PHILADELPHIA, PA., June 23, 1899.

To the Stockholders of the Welsbach Light Company:

In answer to the many inquiries received from the stockholders as to whether the Welsbach Light Company is interested in the Kern Light or the Kern Incandescent Gas Light Company, I am authorized by the Board of Directors of this Company to advise you that **THIS COMPANY IS NOT NOW AND NEVER HAS BEEN INTERESTED IN EITHER THE KERN LIGHT OR THE KERN INCANDESCENT GAS LIGHT COMPANY. The Kern Light, or, to designate it more properly, the Kern Bunsen Burner for use with an incandescent mantle, and the United States patents upon which it is based, were offered to this Company, which refused to purchase them upon the advice of its experts, Dr. Charles F. Chandler, of Columbia College, and Dr. Waldron Shapleigh, its Chief Chemist, and of its Patent Council, Mr. John R. Bennett, of New York City.**

This Company is not now and never has been interested in the Welsbach Incandescent Gas Light Company of England, nor is that Company interested in this Company. Your attention is called to the following correspondence, which defines **THE POSITION OF THE UNITED GAS IMPROVEMENT COMPANY**, whose name is mentioned in the advertisements which offer for subscription the stock of the Kern Incandescent Gas Light Company.

WELSBACH LIGHT COMPANY,
W. E. BARROWS, President.

WELSBACH LIGHT CO.,

BROAD AND ARCH STREETS,

PHILADELPHIA, PA., June 23d, 1899.

MR. THOMAS DOLAN, President the United Gas Improvement Company:

DEAR SIR: In yesterday's and to-day's New York and Philadelphia papers appear the advertisements of the International Banking and Trust Company soliciting subscriptions to the Capital Stock of the Kern Incandescent Gas Light Company. Among the names of the Directors of the said Trust Company published in the advertisements referred to appears the name of "George W. Elkins, United Gas Improvement Company, Philadelphia." As the United Gas Improvement Company has been prominently identified with the Welsbach Light ever since its introduction into the United States, the publication of its name in these advertisements, which also contain suggestions hostile to this Company, has greatly disquieted many of our shareholders. If you are willing to give me an authoritative statement of the position of the United Gas Improvement Company I shall be greatly obliged. Very truly yours,

W. E. BARROWS, President Welsbach Light Company.

THE UNITED GAS IMPROVEMENT COMPANY,
Broad and Arch Sts., Philadelphia, June 23d, 1899.

COL. W. E. BARROWS, President Welsbach Light Company:

Dear Sir: Answering your favor of even date, the United Gas Improvement Company is not now and never has been interested either in the Kern Incandescent Gas Light Company or in the International Banking and Trust Company. Mr. George W. Elkins is neither an Officer nor a Director of the United Gas Improvement Company, and does not represent the United Gas Improvement Company. Very truly yours,

THOMAS DOLAN, President,
United Gas Improvement Company.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

THE STANDARD JUNIOR,

THE STANDARD DOUBLE SUPERHEATER,

LOWE WATER GAS APPARATUS.

Under Contract, 1899:

	SETS.	DAILY CAPACITY.
Fostoria, O.	1	250,000 Cubic Feet.
Derby, Conn.	1	750,000 "
Lowell, Mass.	1	1,000,000 "
Doylestown, Pa.	1	50,000 "
Darby, Pa.	1	400,000 "
Adrian, Mich.	1	125,000 "
Concord, N. H.	1	400,000 "
Sioux City, Iowa	1	750,000 "
Standard Gas Light Co., New York	3	5,400,000 "
Peekskill, N. Y.	1	250,000 "
Westchester, N. Y.	1	250,000 "
Jersey City, N. J.	1	1,000,000 "
Stapleton, N. Y.	1	750,000 "
London, O.	1	125,000 "
Chicago, Ills.	2	3,600,000 "
Putnam, Conn.	1	125,000 "
Mansfield, O.	1	250,000 "
Plymouth, Pa.	1	125,000 "
Athens, Pa.	1	125,000 "
Charlotte, N. C.	1	250,000 "
Consolidated Gas Co., New York	2	2,000,000 "
Quincy, Ills.	1	250,000 "
Boone, Ia.	1	125,000 "
Webster, Mass.	1	50,000 "
Flushing, N. Y.	1	250,000 "
Total	29	18,650,000 "
Previously built	294	187,100,000 "
Grand Total	323	205,750,000 "

Established 1858. Incorporated 1890.
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H. D. ABERNETHY, Sec.

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This is the *original* coal-consuming Furnace for Retort Benches. Burns either Coal or Coke. Full and Half-Depth Regenerative Furnaces for Benches of 6's, 7's, 8's or 9's erected complete.
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Gas Retorts,
TILES, FIRE BRICK.
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Works, Weber, N. J.
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Modern Recuperative Furnaces
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WORKS, Perth Amboy, N. J.
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BENCH SETTINGS,
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A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.
Price List, f.o.b. Galesburg or Mount Vernon.
In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
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C. L. GEROULD, Galesburg, Ills.
Eastern Agent, PERRY BORDEN, 19 Prospect Ave., MOUNT VERNON, N. Y.

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OAKHILL GAS RETORT & FIRE BRICK W'KS
Our immense establishment is now employed almost entirely in the manufacture of
Materials for Gas Companies
We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct
Half and Full Depth Benches of Our Own Design,
Containing 6, 8 or 9 Retorts.
We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

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MANUFACTORY AT
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Red and Buff Ornamental Tiles and Chimney Tops. Baker Oven Tiles 12x12x2 and 10x10x2.
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Sole Agents for New England States.

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A Guide to the Study of the Measurement of Light.
By WILLIAM JOSEPH DIBDIN.
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Gas Plant Machinery

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Gas Engineers
INSPECTION AND ADVICE.

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FOR IMPROVEMENTS OR
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"IRON SPONGE." Saves money, saves labor, and is the most efficient purifying material ever offered as a substitute for lime. We guarantee a large saving, both in cost of material and labor.

AUTOMATIC GOVERNOR.
OVER FOUR HUNDRED NOW IN USE! NO WORKS COMPLETE WITHOUT IT!
WILL PAY FOR ITSELF WITHIN A YEAR! ITS SERVICE SECURES PERFECT DISTRIBUTION!
REDUCES LEAKAGE TO MINIMUM, and BENEFITS THE COMPANY and CONSUMER ALIKE!
IT IS THE ONLY RECOGNIZED AUTOMATIC GOVERNOR IN THE WORLD!

STEAM JET EXHAUSTER. Designed particularly for small works. Combines Exhaust Tube, Steam Governor, Gas Compensator and Bye-Pass Valves in the most compact form possible. Occupies but little space; uses very little steam; saves formation of carbon in retorts; increases yield 10 to 15 per cent. No works too small to use them profitably.

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Hughes' "Gas Works,"

Their Construction and Arrangement,

And the Manufacture and Distribution of Coal Gas.

Originally written by SAM'L HUGHES, C.E.

Rewritten and Much Enlarged by
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Eighth Edition, Revised, with Notices of Recent Improvements.

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Cyanogen.

A PURIFYING MATERIAL FOR GAS.

Soft and porous, it can be used in the natural state without any preparation, and it ensures perfect purification.

SPECIMENS AND PRICES ON APPLICATION.

VAN BAARDA & CO.,
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Parson's Steam Blower,

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREZEE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER,

FOR USING COAL TAR AS FUEL.

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FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.

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JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

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228 and 229 Produce Exchange, New York City.

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BERWIND-WHITE COAL MINING COMPANY'S

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STRICTLY High Grade. . . . .
Carefully prepared.
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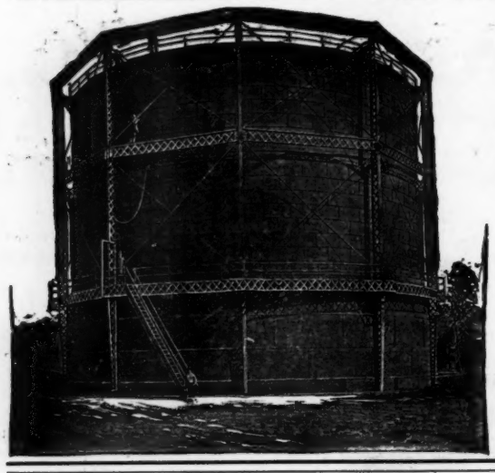

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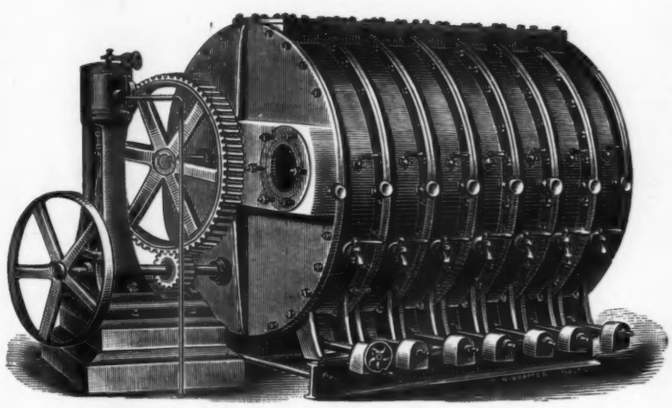

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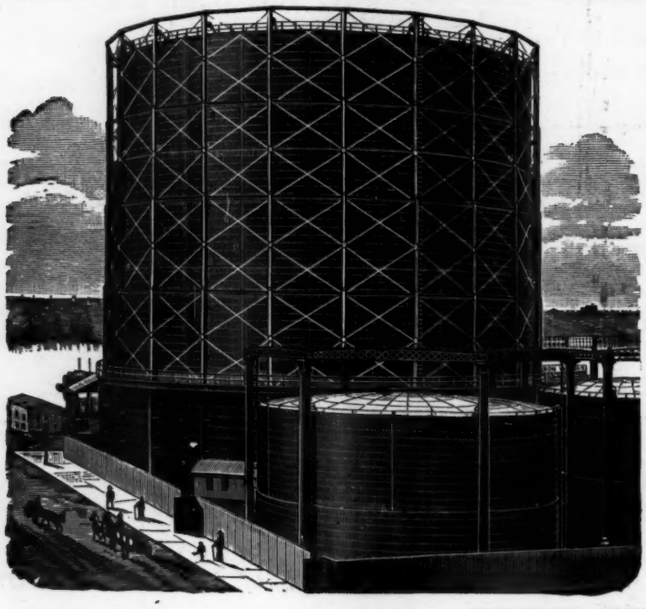

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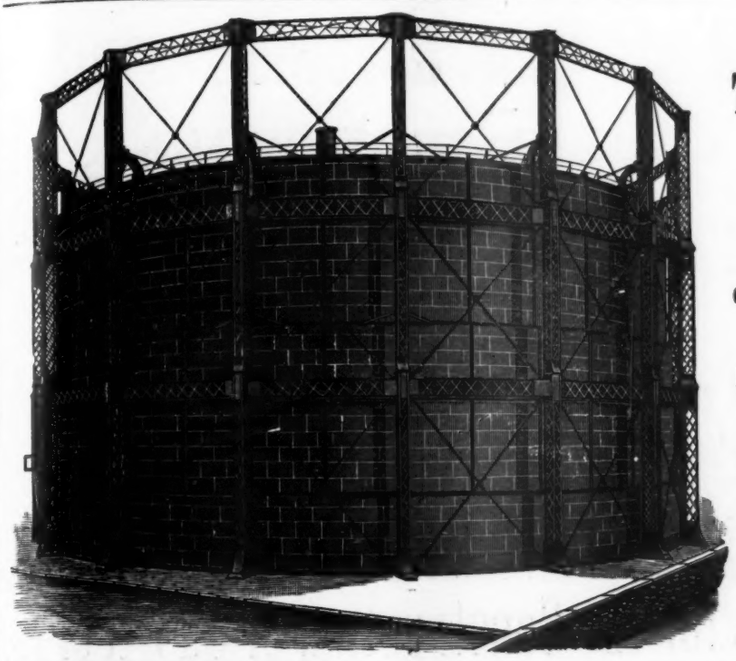

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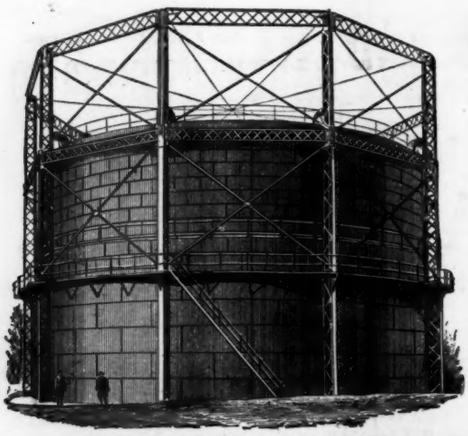

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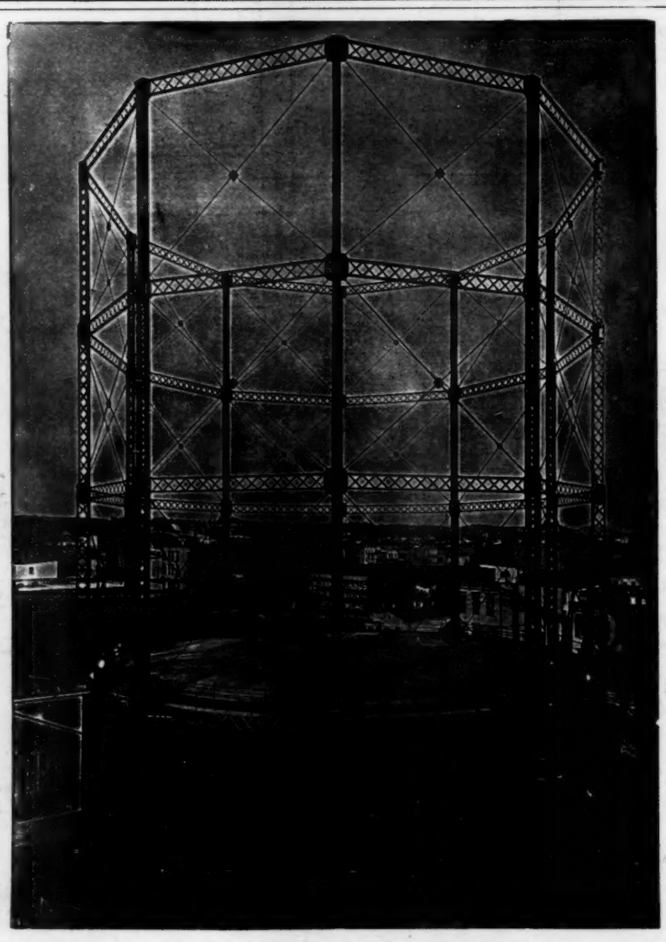

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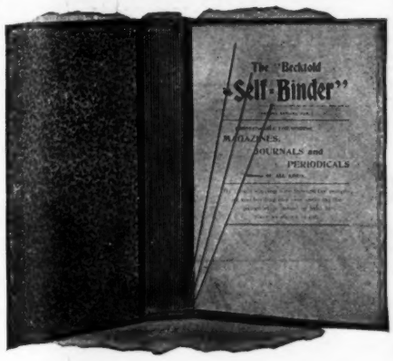

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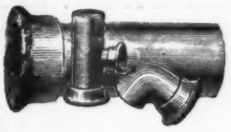

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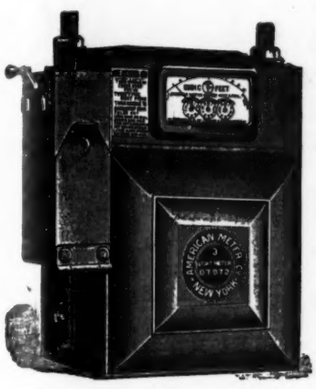

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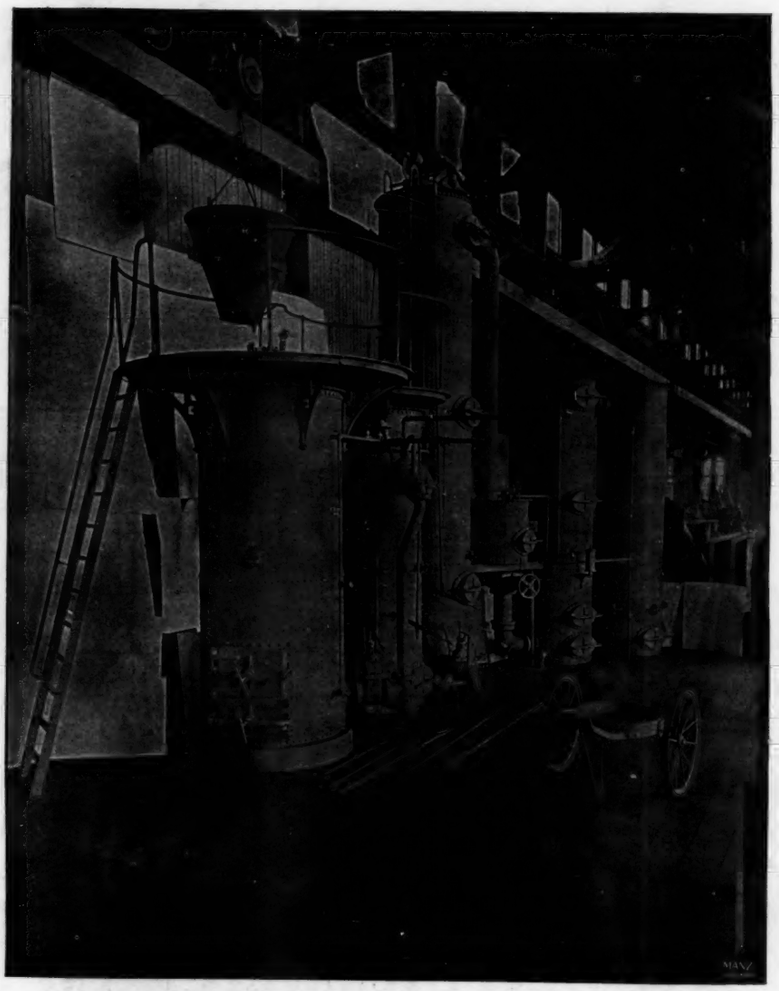

If you elsewhere see this style of AUTOMATIC FUEL CHARGING DEVICE;
If you elsewhere see this style of DOUBLE SUPER-HEATER PLATFORM APPARATUS;
REMEMBER, it has been COPIED BODILY FROM US.

IMPROVED LOWE WATER GAS APPARATUS

Is **completely put together** in our shop before shipment, being only dismantled sufficiently for transportation, **he has an assurance,** not otherwise possible, that when it is re-erected in his works **it will fit, and Look to Fit, and, most important, IS FIT.**

WILLIAM HENRY WHITE,
EASTERN ENGINEER,
32 Pine St., New York.

The Western Gas Construction Co.,

FORT WAYNE, INDIANA.